

BRITISH CHEMICAL ABSTRACTS

A., I.—General, Physical, and Inorganic Chemistry

NOVEMBER, 1937.

Intensities of components of the Stark effect for hydrogen in strong electric fields. T. GUSTAFSON (Z. Physik, 1937, 106, 709—729).—The intensities of the components of the Stark effect for H_β are calc. to a first approximation. An intensity dissymmetry is indicated for the symmetrical violet and red components, the violet being the stronger. In the cases of the four strongest lines the intensity dissymmetry is between 5.6 and 10.7% for a field strength of 500 kv. per cm., but is less in the case of weaker lines. H. C. G.

Fine structure of α -lines of hydrogen and deuterium. R. C. WILLIAMS and R. C. GIBBS (Physical Rev., 1936, [ii], 49, 416).—The average interval between the two major components is approx. the same for both H and D, but approx. 0.01 cm.^{-1} < that predicted by theory. L. S. T.

Fine structure of D_α . M. HEYDEN (Z. Physik, 1937, 106, 499—517).—The fine structure of D_α obtained from discharge tubes under various conditions of tube width, c.d., and cooling with liquid air and H_2 was examined with a Fabry-Perot interferometer. The separation of the two strong components agrees to within 0.2% with Dirac's theory. Of the five transitions theoretically possible, three were obtained in every instance, and the fourth in six instances owing to its low intensity; the existence of the fifth was definitely established. H. C. G.

Molecular hydrogen of stellar atmospheres. M. NICOLET (Bull. Acad. roy. Belg., 1937, [v], 23, 574—581).—A crit. discussion of the methods of identifying mol. H_2 in stellar and solar spectra. F. J. L.

Effective cross-section for excitation of the Na- D lines by impact of sodium ions on helium. W. MAURER and K. MEHNERT (Z. Physik, 1937, 106, 453—457).— Na^+ radiation up to 20 kv. energy is impacted on He atoms and the resulting $\lambda\lambda$ 5890/96 and 5876 are photographed to the exclusion of the latter. The emission of Na- D lines is due to glow discharge and its intensity \propto pressure of He and current. The effective cross-sectional area for excitation is \ll that for discharge alone. L. G. G.

Excitation of sodium hyperfine structure in a molecular beam. B. CARPENTER and R. A. FISHER (Physical Rev., 1937, [ii], 49, 417).—Using a mol. beam excited by high-frequency oscillations in A the separation observed for the two components of D_1 of Na is 0.062 cm.^{-1} and of D_2 , 0.057 cm.^{-1} . L. S. T.

Investigations of vacuum sparks by means of a high-speed rotating mirror. J. A. CHILES, jun. (Physical Rev., 1936, [ii], 49, 860).—Results obtained with vac. sparks between electrodes of Al, Bi, Cd, Cu, Pb, Mg, Pd, Sn, W, Zn, and graphite support the view that the discharge in high vac. between cold electrodes is initiated by field electron emission from the cathode. L. S. T.

Null method of estimating the half-life periods of metastable atomic states. W. LIPPERT (Ann. Physik, 1937, [v], 30, 136—150).—Experimental details and results for A and Ne are given. W. R. A.

Intensity ratios of the hyperfine structure components of the resonance lines of potassium. D. A. JACKSON and H. KUHN (Nature, 1937, 140, 276—277).—The magnetic moment of ^{39}K , deduced from these intensity ratios, is positive. In agreement with other investigators, the val. found for the spin is $3/2$. L. S. T.

Bergmann series of calcium. H. GRAFENBERGER (Ann. Physik, 1937, [v], 30, 267—283).— $\lambda\lambda$ accurate to $\pm 0.03 \text{ \AA.}$ are recorded. Corrections to previous data are noted. Interferometer measurements of the fine structure of the first three members of the series have been made to $\pm 0.002 \text{ \AA.}$ The 3F term of Ca I is shown to be a normal triplet term with no anomalies such as are observed for the D terms of Ca I and the F terms of Ba I. O. D. S.

Deep terms in Ti VI, V VII, Cr VIII, and Mn IX. S. G. WEISSBERG and P. G. KRUGER (Physical Rev., 1936, [ii], 49, 872—873; cf. A., 1936, 1309).— PP^0 multiplets and 2P — 2S lines are tabulated. L. S. T.

Extreme ultra-violet series in Cr VI, Mn VII, and Fe VIII. P. G. KRUGER and S. G. WEISSBERG (Physical Rev., 1937, [ii], 52, 314—317).—The spectra have been photographed with a 21-ft. grazing-incidence vac. spectrograph, and identifications and data for a large no. of lines are tabulated. The first member of the $3d^2D$ — nf^2F series of Cr VI has been found. Term vals. and effective quantum nos., and ionisation potentials of the isoelectronic sequence K I—Co IX are given. N. M. B.

Series spectra in Mn VII and Fe VIII. P. G. KRUGER and S. G. WEISSBERG (Physical Rev., 1936, [ii], 49, 873).—Lines in the extreme ultra-violet involving the $3d^2D$, $4p^2P$, $5s^2S$, $6s^2S$, and several nf^2F terms have been identified in the spectra of Mn VII and Fe VIII. Vals. of the $3d^2D_1$ term and the

corresponding ionisation potentials in the isoelectronic sequence K I—Co IX are tabulated. L. S. T.

Intensity measurements in the arc spectrum of copper. H. T. SMYTH (Physical Rev., 1936, [ii], 49, 872).—Intensity measurements have been made on Cu I lines in the region 3100—3700 Å.

L. S. T.

Spectrum of bromine. I. Structure of Br III. K. R. RAO and S. G. KRISHNAMURTY (Proc. Roy. Soc., 1937, A, 161, 38—48).—About 300 lines of the spectrum produced under different conditions of excitation are assigned to Br III. Deb's classification (A., 1930, 651) is regarded as incorrect and a new scheme, consisting of a system of quartets and doublets, is proposed. The ionisation potential of Br III is given as 35.7 v.

G. D. P.

Pressure shifts of krypton lines. H. MARGENAU and W. W. WATSON (Physical Rev., 1937, [ii], 52, 384—385).—A criticism of the calculations of Kuhn (cf. this vol., 486).

N. M. B.

Fine structure of absorption bands of tellurium. A. PRZEBORSKI (Acta phys. polon., 1934, 3, 527—536; Chem. Zentr., 1936, i, 3640).—Data are recorded for the bands at 4624—5528 Å. and moments of inertia are calc. for the normal and excited states of the Te₂ mol. On Rosen's assignment of band heads, the Te—Te distance $r_0 = 2.44$ Å.; on a new assumption $r_0 = 2.77$ Å.

J. S. A.

Isotopic effect in resonance series of Te₂. B. ROSEN and J. MAT (Bull. Acad. roy. Belg., 1937, [v], 23, 626—645).—The isotopic effect in the resonance series of Te₂ excited by $\lambda\lambda$ 4358 and 4046 Å. of Hg I and 4481 Å. of Mg II has been investigated. The formula of Rosen (A., 1927, 608) for calculation is superior to that of Olsson (cf. A., 1935, 905). The distribution of intensity in the isotopic multiplets is discussed.

F. J. L.

Hyperfine structure and nuclear moment of barium. A. BENSON and R. A. SAWYER (Physical Rev., 1936, [ii], 49, 867—868).—Examination of new and old data on the hyperfine structure of Ba I and Ba II lines shows that for ^{135, 137}Ba i is 3/2.

L. S. T.

Hyperfine structure interval rule as a means of classifying unidentified spectrum lines. H. E. WHITE (Physical Rev., 1936, [ii], 49, 872).—In the Pr spectrum the J vals. have been determined by means of the hyperfine structure patterns. For most of the lines studied in Co, La, and Pr the interval rule holds to within 2—3%.

L. S. T.

Influence of optical excitation energy on transitions involving the 2³P₀ level of mercury. G. A. ROSSELOT (Physical Rev., 1936, [ii], 49, 871—872).—Data for Hg vapour, mixed with N₂, and optically excited at room temp. by the radiation from quartz Hg arcs are recorded.

L. S. T.

Structure of the band spectrum of mercury vapour. III. S. MROZOWSKI (Z. Physik, 1937, 106, 458—562).—Corrections in the two potential curves B³0_g and B³1_g for the diat. Hg mol. discussed in previous work (this vol., 54) involve changes in the interpretation of the band spectrum of the Hg mol.

and in the mechanism of the fluorescence phenomena. These are discussed.

H. C. G.

Classification of the near infra-red spectrum of mercury. II. O. MASAKI and T. MORITA (J. Sci. Hiroshima Univ., 1937, A, 7, 305—313; cf. A., 1936, 1310).—Photographic data to 14,000 Å. are tabulated and classified. Corrections to Part I (*loc. cit.*) are noted.

O. D. S.

Quenching and depolarising collisions and polarisation of resonance radiation in a magnetic field. R. PETERSEN and A. ELLETT (Physical Rev., 1936, [ii], 49, 417).—Theoretical.

L. S. T.

Similar behaviour of negative glow in glow discharges to cathodic current source in arc discharge. G. MACIUC (Bull. Fac. Stiinte Cernauti, 1935, 9, 170—175; Chem. Zentr., 1936, i, 3649).—Similar behaviour is found at pressures of 1—5 mm.

J. S. A.

Effects of chemical combination on the widths and asymmetries of X-ray lines. H. H. ROSEBERRY and J. A. BEARDEN (Physical Rev., 1936, [ii], 49, 884—885).—Such effects have been observed for Ti, Cr, Mn, Fe, and Zn. α -lines were broadened 3—35%, β -lines 0—30%, and γ -lines none. No effect on the separation of the α -doublet was observed. In general, the asymmetries of the lines remained the same as that of the pure metal.

L. S. T.

Soft X-ray absorption of lithium and its halides. H. M. O'BRYAN (Physical Rev., 1936, [ii], 49, 879; cf. this vol., 217).—Absorption spectra of films $< 1 \mu$. thick of Li and its halides have been photographed over the region 170—700 Å. The bands show a width of 2—4.5 v. at the head with less intense continuous absorption extending to shorter $\lambda\lambda$. Band centres are recorded.

L. S. T.

Absorption measurements on medium velocity cathode rays and soft X-rays in oxygen. F. I. CALLISEN (Z. Physik, 1937, 107, 15—43).—Absorption coeffs. of photo-electrons produced in O₂ by the K α radiation of Fe, Ni, Cu, Zn, and Sn were measured by means of variation in pressure. Results are in accord with the diffusion theory of electron absorption. The X-ray mass absorption coeff. $\mu/\rho = 3.02\lambda^3 + 0.16$ in the range $1.4 < \lambda < 2.3$ Å.

L. G. G.

Fine structure of soft X-ray absorption edges. I. Lithium, magnesium, nickel, copper. H. B. SKINNER and J. E. JOHNSTON (Proc. Roy. Soc., 1937, A, 161, 420—440).—Methods for investigating the X-ray absorption edge fine structure of metals in the region 100—300 Å. are described. Details are given of Li K, Mg L₃, L₂, and L₁, Cu M_{2,3}, Ni M_{2,3}. The Li K edge in LiOH has been examined.

G. D. P.

Wave-lengths of K α X-ray satellite lines for elements S (16) to Ge (32). F. K. RICHTMYER and L. G. PARRATT (Physical Rev., 1936, [ii], 49, 644; cf. A., 1936, 1041; this vol., 55).

L. S. T.

Widths of K α X-ray satellite lines. L. G. PARRATT and F. K. RICHTMYER (Physical Rev., 1936, [ii], 49, 644—645; cf. preceding abstract).—A discussion.

L. S. T.

K emission spectra of gallium (31) and germanium (32). H. HULUBEI (Compt. rend., 1937, 205, 440—442).— $\lambda\lambda$ of the weaker lines are recorded and classified. A. J. E. W.

Absorption coefficients for aluminium, copper, and silver in the X-ray region from 13 to 24 Å. R. D. HILL (Proc. Roy. Soc., 1937, A, 161, 284—298).—A description of a vac. grating spectrograph for use in the long- λ X-ray region is given. Intensities are measured photographically and mass absorption coeffs. deduced for Al, Cu, and Ag for $\lambda\lambda$ 13.3, 14.6, 17.6, and 23.7 Å. G. D. P.

L emission bands of zinc, copper, nickel, and cobalt. J. FARINEAU (Nature, 1937, 140, 508).—Curves showing the intensity of the $L\alpha$ bands against e.v. are given. The observed bands represent transitions of both 3d- and 4s-electrons. L. S. T.

M emission bands of zinc, copper, and nickel. H. W. B. SKINNER and J. E. JOHNSTON (Nature, 1937, 140, 508—509).—The structures of the 3d- and 4s-electron bands are discussed in the light of observations on the M emission bands and the results of Farineau (cf. preceding abstract). L. S. T.

Intensity and structure changes of the $L\alpha$ emission lines of copper and iron on intense cooling of their anticathodes. K. PROSAD and A. T. MAITRA (Nature, 1937, 140, 464).—The intensity of the Cu $L\alpha$ line at the liquid O₂ temp. of the target is 70% of that from the target at room temp. The corresponding figure for Fe is approx. 60%. The L lines shift relatively to each other with the change in temp., and changes in the widths of the lines also are indicated. L. S. T.

$L\alpha$ satellites for some heavy elements and rare earths. (MLEE.) Y. CAUCHOIS (Compt. rend., 1937, 205, 519—521; cf. A., 1936, 1169).— $\lambda\lambda$ of a no. of satellites given by U, Th, Bi, Mg, Au, Pt, Re, Ta, Dy, Gd, and Sm are recorded, and a classification is given. A. J. E. W.

Widths of the L series X-ray lines and limit of Pb (82). R. E. SHRADER (Physical Rev., 1936, [ii], 49, 644).—The widths of certain of these lines have been measured. Calc. widths of M, N, and O levels are recorded. L. S. T.

Difference of dispersion and sharpness of lines of X-ray dispersion spectra on entrance or exit from the refracting medium. Refraction in thin films of glycerol on quartz. H. SEEMANN (Physikal. Z., 1937, 38, 683—688).—The sharpness of Mo K lines after refraction at quartz is very different according as the rays are entering or leaving the medium. A. J. M.

Surface ionisation of barium on tungsten. A. N. GUTHRIE (Physical Rev., 1936, [ii], 49, 868).—The positive ion current, produced by surface ionisation of Ba on W, which results when a mol. beam of Ba strikes a W filament becomes detectable near 1700° K., increases with filament temp. up to 2000° K., and then remains const. up to 2600° K. Between 2000° and 2600° K. the ionisation efficiency is ~ 100%. L. S. T.

Origin of the additional ionisation in the barrier layers of the higher atmosphere. J. JUILFS (Physikal. Z., 1937, 38, 691).—The additional ionisation produced at a barrier layer in the higher atm. was investigated by means of two ionisation chambers, one containing A, the other air. The effect in the former was > in the latter, indicating the existence of radioactive γ -radiation in these layers. A. J. M.

Ionisation in gases effected by alternating current. H. W. PAEHR (Z. Physik, 1937, 106, 730—750).—Under certain conditions ions produced in a gas by application of an alternating potential do not travel to the electrodes, but accumulate to form a space charge. A method for measurement of this ionisation is described and results for air, A, and Hg vapour are reported and discussed. H. C. G.

Energy distribution of photoelectrons from sodium. A. G. HILL and L. A. DUBRIDGE (Physical Rev., 1936, [ii], 49, 877).—Experimental curves over the range 2400—4350 Å. agree with the theoretical for $\lambda\lambda$ for the high-energy end of the curve where the Fermi function is the controlling factor. L. S. T.

Positive ion work function of molybdenum. H. J. GROVER (Physical Rev., 1936, [ii], 49, 878).—Measurements by means of the mass spectrograph of the positive ion currents as a function of temp. give a val. for the positive ion work function which is > any previously reported, and balances the cycle $\Phi_{+0} + \Phi_{-0} = V + U$, where V is the ionisation potential and U is the latent heat of condensation of neutral atoms. L. S. T.

(A) Influence of electron reflexion on photoelectric emission. (B) Hypotheses for photoelectric emission analysis. W. B. NOTTINGHAM (Physical Rev., 1936, [ii], 49, 646, 649). L. S. T.

Electron motion in a plasma. E. G. LINDER (Physical Rev., 1936, [ii], 49, 645—646).—Mathematical. L. S. T.

Investigation of the electron avalanche with the cloud chamber. H. RAETHER (Z. Physik, 1937, 107, 91—110).—The cumulative collision ionisation process (electron avalanche) initiated by one electron moving in a uniform electric field has been investigated with a modification of the cloud chamber. Measurements in air and H₂ are reported and the thermic energy of the electrons is calc. H. C. G.

Intensity of scattering of electrons as a function of angle. H. J. YEARIAN and J. D. HOWE (Physical Rev., 1936, [ii], 49, 417—418).—The curves for Cd are similar to those from Ag (cf. A., 1936, 1439). L. S. T.

Behaviour of a bundle of monokinetic electrons after penetrating an absorbing foil. J. J. TRILLAT and A. HAUTOT (Ann. Physik, 1937, [v], 30, 165—168).—The velocity of electrons which have passed through an absorbing foil remains unchanged if their original path is unaltered, but if the electrons in penetrating the foil undergo deviation their velocity is diminished. W. R. A.

Velocity distribution of secondary electrons produced by cathode rays in gases. F. FREY

(Ann. Physik, 1937, [v], 30, 297—312).—The velocity distribution of secondary electrons produced in air by cathode rays up to 500 v. velocity has been investigated. To a first approximation the distribution is independent of the primary velocity. The majority of secondary electrons have velocities <10 v. The influence of gas pressure and construction of the apparatus and of stray primary electrons are discussed. Observed velocities are < those obtained by Ishimo for primary energies 7000—14,500 v. (Phil. Mag., 1916, 32, 202). The velocity distribution is similar to that for secondary electrons from Cu (cf. Gehrts, Ann. Physik, 1911, 36, 1009) and from Pt (cf. Becker, *ibid.*, 1925, 78, 247).

O. D. S.

Distribution of secondary electrons liberated from an aluminium gauze. C. HAGEN and M. SANDHAGEN (Z. Physik, 1937, 107, 132—137).—Measurements of the intensity and distribution of the stream of secondary electrons liberated by a primary electron beam impinging on an Al gauze of fine mesh are reported.

H. C. G.

Magnetic spectrum of positrons generated in silver and lead by γ -rays from radium-C. G. L. LÖCHER and C. L. HAINES (Physical Rev., 1936, [ii], 49, 641).—Comparison of spectrograms with Ag and Pb as positron-generating elements and γ -ray sources of 80% Ms-Th₁ + 20% Ra, and Ra alone, shows (i) that the upper energy limit of the positrons is the same for both sources and lies between 1.11 and 1.115 m.e.v., indicating that the limit previously ascribed to Th-C'' γ -rays (this vol., 488) is due to the Ra contamination of the Ms-Th₁ source, (ii) the energy limit for Pb and Ag is the same with either γ -ray source, and (iii) with Ag, but not with Pb, intermediate lines appear. No correlation between positron lines from Ag and known γ -ray lines from Ra-C has been found.

L. S. T.

Widths of nuclear resonance levels and the calibration of ion-beam energies. L. R. HAFSTAD, N. P. HEYDENBURG, and M. A. TUVE (Physical Rev., 1936, [ii], 49, 866).

L. S. T.

Diffraction of slow positive ions. A. G. EMSLIE (Nature, 1937, 140, 463).—Photographs showing the scattering of Li ions by a jet of Na vapour and by a red-hot Ni target (at grazing angle) are reproduced. An explanation of the results, which seems to establish the wave nature of Li ions, is discussed.

L. S. T.

Negative ions in oxygen and hydrogen. O. LUHR and C. T. MALE, jun. (Physical Rev., 1936, [ii], 49, 860).—The nature of negative ions formed by electron attachment with subsequent ageing in H₂, O₂, and H₂-O₂ mixture has been investigated. A wide variety of newly-formed ions, ranging from H⁻ to complex ions of mol. wt. >100, has been found in H₂. In relatively pure O₂, the ions O⁻, H₂O₂⁻, O₃⁻, and O₄⁻ appear to be formed.

L. S. T.

Doppler effect in canal rays. B. VENKATESACHAR (Current Sci., 1937, 6, 51—52).—A review.

Electron scattering in helium. M. GOODRICH (Physical Rev., 1937, [ii], 52, 259—266).—Angular distribution curves for total and for elastic scattering,

obtained by investigations with a special scattering apparatus, of 100-v. incident electrons, and curves for scattering with various energy losses are discussed and compared with theoretical predictions.

N. M. B.

Limits of validity of the resonance principle of charge transfer. F. WOLF (Ann. Physik, 1937, [v], 30, 313—332; cf. this vol., 274).—The variation with ionic velocity of the charge-transfer cross-section for the processes N₂⁺ → Ne, N⁺ → Ne, N₂⁺ → He, He⁺ → Ne, Ne⁺ → N₂, He⁺ → N₂ has been measured. From these and earlier results it is concluded that the resonance principle of Kallmann and Rosen is, except for some individual deviations, obeyed at ionic energies > the resonance energy. At ionic energies > resonance energy large vals. of ionisation are obtained, in contradiction to the principle.

O. D. S.

Determination of the at. wts. of lithium, potassium, and rubidium from isotope abundance measurements. A. K. BREWER (Physical Rev., 1936, [ii], 49, 867).—The abundance ratios, estimated from positive thermions emitted from Pt discs impregnated with the alkali, are ⁷Li: ⁶Li 11.60 ± 0.06, ³⁹K: ⁴¹K 14.20 ± 0.003, and ⁸⁵Rb: ⁸⁷Rb 2.59 ± 0.01. The Li ratio corr. for an isotope effect is 12.52; K and Rb showed no such effect. The at. wts. calc. from these ratios and the most probable vals. for the packing fractions are Li 6.939, K 39.094, and Rb 85.46.

L. S. T.

Search for the isotopes of hydrogen and helium of mass 3. (LORD) RUTHERFORD (Nature, 1937, 140, 303—305).—A review.

L. S. T.

Mass ratio of the carbon isotopes from the spectrum of CN. F. A. JENKINS and D. E. WOOLDRIDGE (Physical Rev., 1936, [ii], 49, 882).—measurements on the 0, 0 and 0, 1 bands of ¹³C¹⁴N give 13.0089 as a preliminary val. for ¹³C (limit of error 0.0005), using 12.0035 for ¹²C.

L. S. T.

Mass-spectrographic determination of mass changes in some carbon transmutations. K. T. BAINBRIDGE and E. B. JORDAN (Physical Rev., 1936, [ii], 49, 883).—New vals. for the mass differences of the matched doublets ¹²C + ¹H—¹³C and ¹H₂—²D are 4.5 ± 0.1 and 1.53 ± 0.04 × 10⁻³ unit, respectively. The ¹²C + ¹H—¹³C separation gives 3.6 m.v. energy available for the γ -ray, positron, and neutrino in the radiative capture of a proton by ¹²C and the subsequent disintegration of ¹³N. Using both doublet separations, the energy of the proton and recoil nucleus in the reaction ¹²C + ²H → ¹³C + ¹H is 2.76 m.v., in agreement with the disintegration figure. These measurements prove that in the C + proton and deuteron reactions involving the transmutation of ¹²C to ¹³C there is insufficient energy for a 3.5—4 m.v. γ -ray in addition to the known products and their energies.

L. S. T.

Mass-spectrographic measurement of the mass separation of certain doublets. E. B. JORDAN and K. T. BAINBRIDGE (Physical Rev., 1936, [ii], 49, 883).—Comparison of the O—CH₄ and the N—CH₂ doublets in a large no. of spectra gives for the mass differences CH₄—O and CH₂—N the vals.

0.0369 \pm 0.0002 and 0.0130 \pm 0.0002, respectively, in good agreement with the vals. obtained from disintegration experiments. L. S. T.

Radioactivity of potassium and geological time. A. K. BREWER (Science, 1937, 86, 198—199).—Taking into account the fact that the radioactivity of K is confined largely to ^{40}K , and using the most recent vals. for the half-life and disintegration const., it is calc. that the upper limit for the age of the earth is slightly $<3 \times 10^9$ years. The ratios of the amount of ^{40}K present at various geological ages to that now in existence are recorded. L. S. T.

Extreme intervals between radioactive emissions. E. J. GUMBEL (J. Phys. Radium, 1937, [vii], 8, 321—329).—Theoretical. The mean interval between consecutive emissions is calc., and the distribution of the m th interval and its characteristics are established. F. J. L.

Characteristic α -ray tracks in infected photographic emulsions. T. R. WILKINS (Physical Rev., 1936, [ii], 49, 639).—When special emulsions are infected with drops of solutions of Ra and its products or with Th active deposit, the α -rays corresponding with the remaining members of the two series leave tracks which, in the developed plates, appear as rows of grains proportional in no. to the air ranges of the various α -rays. L. S. T.

Disintegration of aluminium by polonium α -particles. W. R. KANNE (Physical Rev., 1937, [ii], 52, 266—270).—Using a Po source, the thick target absorption curve for the protons emitted by Al under α -particle bombardment was obtained. The structure of the groups observed and the interpretation of results agree with the investigations of Chadwick (cf. A., 1932, 318), but the ranges of the principal groups are in better accord with those found by Pose (cf. A., 1930, 1232). Discrepancies are discussed. An increase of proton yield with the height of the resonance levels is observed. The relative intensity of the short- and long-range groups is 4.0, and the difference in energy of any two corresponding groups is 2.4 m.e.v. N. M. B.

Materialisation of energy of β -rays. M. MONADJEMI (J. Phys. Radium, 1937, [vii], 8, 347—352; cf. this vol., 389).—The no. of pairs produced in superficially equal masses of Cu and Al is of the same order of magnitude; the probability of materialisation $\propto Z$. The ratio, no. of positrons : no. of negatrons emitted by the radioactive source, is $2\text{--}3 \times 10^{-3}$ for RaBr₂ and $3\text{--}4 \times 10^{-3}$ for Th-B + C. F. J. L.

β -Ray spectrum of radium-E. J. S. O'CONNOR (Physical Rev., 1937, [ii], 52, 303—314).—In view of widely varying available data, investigations were made with a magnetic spectrometer, with coincidence counting, for various conditions of source strength, mounting, and aperture of defining slits. Results indicate that the high-energy end-point val. depends on source strength and on the width of the defining slits. Data from all but very strong sources gave a Konopinski-Uhlenbeck plot, linear within the limits set by statistical fluctuations and finite slit widths.

The extrapolated high-energy end-point was 1.25 + 0.03 m.e.v. N. M. B.

β -Decay as due to a neutrino shower. N. S. N. NATH (Nature, 1937, 140, 278—279).—The asymmetry in the curve showing the energy distribution of electrons in β -decay can be explained on the assumption that the final process consists of a shower of neutrinos, the no. in the shower being dependent on the transition energy of the nucleus. L. S. T.

Ionisation measurement of γ -radiation. G. W. C. KAYE and W. BINKS (Proc. Roy. Soc., 1937, A, 161, 564—592).—An investigation undertaken to unify the measurement of γ -ray and X-ray dosage for therapeutic purposes. Difficulties encountered by other investigators have been overcome by the use of a large (12 ft. \times 10 ft.) free-air ionisation chamber, and a narrow beam of γ -rays from a source situated <6 ft. from the centre of the chamber. The relevant experimental details are fully discussed. The conditions under which small ionisation chambers can be calibrated by comparison with the large free-air standard are considered. The Sievert unit dose of γ -rays is found to be equiv. under specified conditions to approx. 8r. A revised definition of r so that it can be used as a measure of both γ and X-rays is suggested. G. D. P.

Photo-electric effect of ^2H . L. MOTZ and W. RARITA (Physical Rev., 1937, [ii], 52, 271—273; cf. this vol., 391).—The total photo-electric cross-section of ^2H for an exponential potential is calc. with the best available nuclear consts. The val. obtained for Th-C' γ -rays is 13.1×10^{-28} sq. cm. N. M. B.

Nuclear photo-effect at high energies. F. KALCKAR, J. R. OPPENHEIMER, and R. SERBER (Physical Rev., 1937, [ii], 52, 273—278).—Mathematical. Relations are investigated between the cross-sections for reactions and the decay consts. of the compound nuclei for nuclear transmutations when the energy is so high that the levels formed have a smaller spacing than their breadth. Results are applied to the photo-electric disintegration of nuclei of intermediate at. wt. by 17 m.e.v. γ -rays. The connexion between the evaluation of transmutation probabilities and the resonance formulæ appropriate to lower excitation energies is examined. N. M. B.

Magnetic field acting on neutrons inside magnetised iron. O. R. FRISCH, H. VON HALBAN, jun., and J. KOCH (Nature, 1937, 140, 360).—The precession of neutrons inside magnetised Fe has been investigated. L. S. T.

Expulsion of neutrons from lead by cosmic rays. B. ARAKATSU, K. KIMURA, and Y. UEMURA (Nature, 1937, 140, 277—278).—An increase in the no. of kicks in a neutron counter when placed inside a Pb chamber suggests that neutrons are liberated from Pb by cosmic ray photons. A further increase occurs when the Pb chamber is filled with paraffin. L. S. T.

Scattering of neutrons by ortho- and para-hydrogen. J. SCHWINGER and E. TELLER (Physical Rev., 1937, [ii], 52, 286—295).—Mathematical. Cal-

culations indicate that experiments on the scattering of neutrons by *o*- and *p*-H₂ would permit the determination of the sign of the singlet state binding energy and the range of the neutron-proton interaction, and would provide direct information on the spin dependence of the latter. N. M. B.

Neutron scattering cross-section as a function of energy. A. C. G. MITCHELL and R. N. VARNEY (Physical Rev., 1937, [ii], 52, 282—285; cf. A., 1936, 1044).—The study of scattering of neutrons of energy range 0.02—80 v. from Fe, Ni, and Pb was completed by measuring the activation of Ag, Rh, and CHI₃ detectors. Indirect determination of the scattering of C neutrons by two methods showed close agreement. The scattering cross-section for Ni decreased slowly with neutron velocity, that for Pb increased slightly, and that for Fe remained const. over the whole range. The directional distribution of neutrons from the top of a paraffin cylinder containing a Ra-Be source agreed closely with calculations based on a cosine distribution law. N. M. B.

Magnetic scattering of neutrons. M. D. WHITAKER (Physical Rev., 1937, [ii], 52, 384).—Attempts to detect the magnetic scattering of slow neutrons by comparing the scattering by certain metals and their respective ions (cf. Halpern, this vol., 489), using Mn, MnO, MnO₂, Fe, and Fe₂O₃, gave negative results. A slight variation between MnS and Mn + S was probably due to the presence of moisture. N. M. B.

Energies of selectively absorbed neutron groups. F. RASETTI, G. A. FINK, H. H. GOLDSMITH, and D. P. MITCHELL (Physical Rev., 1936, [ii], 49, 869).—Measured absorption coeffs. in B, the corresponding relative velocities, and the calc. energies of the C, D, A, and I Fermi-Amaldi neutron groups are recorded. L. S. T.

Experiments with iso-energetic neutrons. E. T. BOOTH and C. HURST (Proc. Roy. Soc., 1937, A, 161, 248—260).—Iso-energetic neutrons, obtained by bombarding D₂ with D⁺ ions, have a mean free path of 4.6 ± 0.9 cm. in paraffin wax. The elastic scattering cross-section, 1.8×10^{-24} sq. cm., agrees with theoretical prediction. A no. of nuclear reactions has been investigated and the transmutation of S into ³²P + proton is reported. G. D. P.

Retardation of homogeneous neutrons by passage through substances containing hydrogen. G. WETTERER (Ann. Physik, 1937, [v], 30, 284—296).—The energy loss on passage through paraffin wax of neutrons of homogeneous energy obtained by the bombardment of ND₄Cl with deuterons has been investigated and compared with vals. for neutrons from a Ra-Be source. Results using B and Cd indicators agreed with theory of the slowing of neutrons by collision with H nuclei. With a Ag indicator max. of activity of Ag (138 sec.) and Ag (24.6 sec.) were observed at greater neutron speeds. Vals. of the resonance energies for the capture of neutrons by Ag calc. from the position of these max. agree with those obtained by Goldsmith and Rasetti (A., 1936, 1172). The yield of neutrons in the D-D reaction is calc. to be 1.3×10^5 neutrons per sec. per milliamp. for a pure D compound. O. D. S.

Absorption of neutrons slowed down by paraffin at different temperatures. P. N. POWERS, G. A. FINK, and G. B. PEGRAM (Physical Rev., 1936, [ii], 49, 650).—Data showing the changes in absorption by various materials, e.g., Cd, B, Ag, LiF, Sm, Rh, Gd, and HgO, with the paraffin surrounding the Be-Rn source kept at room temp. and then at liquid air temp. are recorded. L. S. T.

Scattering of slow neutrons at atomic lattices. II. G. C. WICK (Physikal. Z., 1937, 38, 689—690; cf. this vol., 389).—Theoretical. The effect of isotopes and nuclear spin on the scattering of slow neutrons at crystal lattices is considered. The effect of isotopes is important when they have considerably different scattering consts. Nuclear spin must be taken into account when there is strong coupling between nuclear and neutron spins, which is the case with H₂. A. J. M.

Method of obtaining polarised neutron beams. H. VON HALBAN, jun. (Nature, 1937, 140, 425).—The possibility of obtaining these beams by selective absorption on passing through a substance cooled to low temp. is pointed out. Paramagnetic salts magnetised at low temp. might be used for this purpose. L. S. T.

Discussion on β -type of nuclear transformations. C. D. ELLIS, J. D. COCKCROFT, R. PIERLS, H. O. W. RICHARDSON (Proc. Roy. Soc., 1937, A, 161, 447—460).—A discussion on the form of the energy distribution in the nuclear β -ray spectrum. G. D. P.

Transmutations of atomic nuclei. N. BOHR (Science, 1937, 86, 161—165).—A summary of lectures. L. S. T.

Time distribution of counts due to a constant source and a radioactive substance which it produces. L. DEVOL and A. RUARK (Physical Rev., 1936, [ii], 49, 877).—A formula for the size-distribution of the time intervals between counts caused by a const. source and a radioactive substance which it produces is given. L. S. T.

Resonances in transmutations of light nuclei. F. KALCKAR, J. R. OPPENHEIMER, and R. SERBER (Physical Rev., 1937, [ii], 52, 279—282).—The sharp resonances observed in many transmutations involving light nuclei require fairly strict selection rules to limit the decay rates of the corresponding compound nuclei, and these follow in several cases from the slowness of the interconversion of spin and orbital angular momentum. Conclusions are discussed in relation to the bombardment of B and F by protons. N. M. B.

Artificial radioactivity with low potentials. E. BERTL, F. OBORIL, and K. SITTE (Z. Physik, 1937, 106, 463—473).—Sufficient neutrons are obtained by bombardment of Be foil with deuteron canal radiation to produce artificial radioactivity in Ag and Rh. Results are discussed theoretically. L. G. G.

Production of artificial radioactivity by means of neutrons. E. AMALDI (Physikal. Z., 1937, 38, 692—734).—A comprehensive review dealing with the production of rapid neutrons, the retardation of neutrons by elastic collisions with protons, neutrons

with energy <1 v., and the production of radioactive nuclei by neutron bombardment. A. J. M.

Artificial radioactivity of very long life. E. McMILLAN (Physical Rev., 1936, [ii], 49, 875—876).—A Be-Al alloy target used as a neutron source and exposed to deuterons for a long period shows an activity, probably due to ^{10}Be , with a min. val. of half-life ≈ 10 years. Mo and brass taken from the same apparatus struck by the deuteron beam show an activity of half-life approx. 3 months, possibly due to $^{13}\text{C} + ^2\text{H} \rightarrow ^{14}\text{C} + ^1\text{H}$. The electrons from both active substances are slow; the absorption curves differ in shape, but have the same end-point.

L. S. T.

Artificial radioactivity of radiophosphorus. Y. Y. SHA (Z. Physik, 1937, 107, 111—131).—A pressure ionisation chamber for the detection of positrons produced from Al by means of α -particles is described. 14.6 times the no. of ions result from the positrons at pressures of 40 kg. per sq. cm. as at normal chamber pressures. The yield of positrons increases with the range of the α -particles, two maxima at $R = 42.8$ and 53.8 mm. corresponding with resonance levels. Mass absorption coeffs. measured for Al, Fe, Ni, Cu, Zn, Ag, Sn, Pt, and Pb range from 2.6 to 4.0 and \propto the periodic no. of the element. The half-life of radio-P is 3.15 ± 0.05 minutes.

L. G. G.

Positron-electron-emitting isomeride in radio-silver. M. L. POOL, J. M. CORK, and R. L. THORNTON (Physical Rev., 1937, [ii], 52, 380).—The periods of Ag radioactive products obtained by bombarding Ag with neutrons from various sources can be explained by assigning to ^{106}Ag the double duty of emitting positrons of period 25.5 min. and electrons of period 8 days. The reactions considered are: $n' + ^{107}\text{Ag} \rightarrow ^{106}\text{Ag} + 2n'$; $n' + ^{106}\text{Cd} \rightarrow ^{106}\text{Ag} + p'$; $^2\text{D} + ^{105}\text{Pd} \rightarrow ^{106}\text{Ag} + n'$; $^4\text{He} + ^{103}\text{Rh} \rightarrow ^{106}\text{Ag} + n'$; $^{106}\text{Ag} \rightarrow ^{106}\text{Pd} + ^0_+1\text{e}$; $^{106}\text{Ag} \rightarrow ^{106}\text{Ag} + ^0_-1\text{e}$.

N. M. B.

Some chemical properties of element 43. C. PERRIER and E. SGRÈ (J. Chem. Physics, 1937, 5, 712—716).—A plate of Mo bombarded with deuterons in a cyclotron shows a strong activity which, after exclusion of all other possible elements by analysis, indicates the presence of a radioactive isotope of Ma. The similarities and differences in the chemical behaviour of Ma and Re are reviewed. Ma closely resembles Re except that Ma does not volatilise in a current of HCl.

W. R. A.

Neutron-induced radioactivity of the noble metals. E. McMILLAN, M. KAMEN, and S. RUBEN (Physical Rev., 1937, [ii], 52, 375—377).—Preliminary results for Hg, Au, Pt, and Ir are reported. Assignments and data for identified activities are tabulated and discussed.

N. M. B.

Analysis of cosmic rays. W. HEITLER (Proc. Roy. Soc., 1937, A, 161, 261—283).—An attempt is made to analyse cosmic rays assuming (a) that the highly penetrating particles are not electrons or (b) that they are electrons. It is concluded that existing observational data are more easily explained under assumption (a), but a final decision must await further experimental evidence.

G. D. P.

Absorption curve of the hard components of cosmic ultra-radiation. A. EHMERT (Z. Physik, 1937, 106, 751—773).—Using the coincidence method with Geiger counters, measurements of cosmic radiation in the sea were made to depths of 243 m. It is shown that the absorption curve may be represented as a power function of the form $N = N_1/h^c$.

H. C. G.

Energy and penetrating power of the cosmic radiation. J. CLAY (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 564—574).—The data concerning the corpuscular nature of cosmic rays are summarised. It is supposed that absorption by matter consists of a decrease in the no. of protons partly by ionisation and radiation, and partly by replacement by neutrons which are later replaced by protons at a lower level.

J. G. A. G.

Heavy particles produced by cosmic-ray counters. C. D. ANDERSON and S. H. NEDDERMEYER (Physical Rev., 1936, [ii], 49, 415).—Approx. 100 of the 7000 cosmic-ray tracks observed at Pike's Peak are due to heavy particles (cf. this vol., 491). Most of the tracks appear due to protons, and are ejected in all directions with little relation to the direction of the incoming beam. In several cases, protons and electrons originate in the same centre, the energies of the latter often being >100 m.e.v. The proton tracks result from the disintegrations produced by both ionising and non-ionising rays, and practically all the heavy tracks can be interpreted only as secondaries produced within the atm. or the material above the chamber. Certain types of disintegrations, hitherto unobserved at sea level, indicate the presence of neutrons at high altitudes.

L. S. T.

Cloud chamber study of the ionisation produced by cosmic rays in the neighbourhood of a block of lead. E. G. SCHNEIDER (Physical Rev., 1936, [ii], 49, 871).—For n electrons with sufficient energy to pass through the Pb, approx. $0.5n$ are stopped, and $0.5n$ are created in the Pb by photons (γ), and $0.1n$ electron pairs and $0.01n$ more complicated showers are produced.

L. S. T.

Investigation of cosmic-ray showers at 4000 m. above sea-level. H. C. SHAN, B. B. KISILBASC, and D. KETILADGE (Proc. Roy. Soc., 1937, A, 161, 95—107).—The Z^2 law for the relative frequency of showers from different elements is as valid at high altitudes as at sea level. The size of showers increases with at no., Z , and with thickness of shower-producing material, indicating that all rays in an average shower are not produced in a single act. The absorption of shower rays follows a Z law and is ascribed to extranuclear electrons. Showers from Pb contain rays with ranges from a few mm. up to several cm. of Pb, those from lighter elements containing on an average rays of longer range. Since the absorption of single shower rays is different from that of the shower as a whole, it is concluded that identification of thickness of shower-producing material (at max. of transition curve) with range is untenable.

G. D. P.

Automatic coincidence counter measurements on shipboard of the cosmic-ray latitude effect. T. H. JOHNSON and D. N. READ (Physical Rev., 1936,

[ii], 49, 639).—Preliminary measurements are recorded. L. S. T.

Variation of cosmic-ray showers with altitude from counter measurements. R. H. WOODWARD (Physical Rev., 1936, [ii], 49, 638). L. S. T.

New high-altitude measurements on cosmic-ray intensities. R. A. MILLIKAN, H. V. NEHER, and S. KORFF (Physical Rev., 1936, [ii], 49, 871).—Intensities at altitudes up to >26,000 ft. in S. America and in Asia agree closely. The apparent absorption coeffs. are only slightly different from that in temperate latitudes. L. S. T.

Frequency of occurrence of cosmic-ray bursts as a function of altitude and size of burst. R. T. YOUNG, jun. (Physical Rev., 1936, [ii], 49, 638).—The ratio of frequency of occurrence of bursts at Cambridge, Mass. (1 atm.), and Mt. Evans, Colorado (45 cm.), increases with an increase in size of burst. L. S. T.

World-wide effect in cosmic-ray intensity, as observed during a recent magnetic storm. V. F. HESS and A. DEMMELMAIR (Nature, 1937, 140, 316—317).—Cosmic-ray ionisation was influenced all over the earth by the magnetic disturbances between 24th and 25th April, 1937. A decrease of cosmic-ray intensity followed that of the magnetic intensity. L. S. T.

Cosmic rays and magnetic storms. S. CHAPMAN (Nature, 1937, 140, 423—424; cf. preceding abstract). L. S. T.

Evidence for neutron-proton shells from nuclear masses. H. A. BETHE (Physical Rev., 1936, [ii], 49, 869—870).—Theoretical. L. S. T.

Energy levels of the nuclei of light elements. H. A. WILSON (Physical Rev., 1936, [ii], 49, 415—416).—Hypothetical. L. S. T.

Theory of nuclear forces. A. MARCH (Z. Physik, 1937, 106, 532—538).—Theoretical. The universal length γ occurring in connexion with the theory of nuclear forces and proton-neutron forces is shown to be nearly equal to the classical electron radius. The measurements of Anderson and Neddermeyer and of Blackett and Wilson on the slowing down of high-speed electrons lead to the same val. H. C. G.

Statistics and nuclear reactions. V. WEISSKOPF (Physical Rev., 1937, [ii], 52, 295—303).—Mathematical. Statistical methods are applied to the calculation of nuclear processes when the energies involved are large in comparison with the lowest excitation energies of nuclei. N. M. B.

Kinetic nuclear energy in the Hartree-Fock model. S. TOMONAGA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 32, 229—232).—Mathematical. A. J. M.

Empirical accuracy of mass-energy ratios. W. BRAUNBEK (Z. Physik, 1937, 107, 1—11).—The mean val. of the unit of at. mass ($O = 16$) is 0.922×10^9 e.v. $\pm 1.0\%$. This is calc. from the known energy changes in 31 suitable reactions of at. nuclei and from the latest mass vals. of Aston and Bain-

bridge. Hence the velocity of light = $2.98_5 \times 10^{10}$ cm. per sec., $\pm 0.5\%$. Limits of error are discussed. H. C. G.

Sign of the magnetic moment of the proton. I. I. RABI, J. M. B. KELLOGG, and J. R. ZACHARIAS (Physical Rev., 1936, [ii], 49, 421—422).—This moment, measured by a method of non-adiabatic transitions, is positive, i.e., it has the spin direction. L. S. T.

Quantitative relationship between the magnetic moments of the atomic nucleus. H. SCHÜLER (Z. Physik, 1937, 107, 12—14).—For heavy at. nuclei with an odd no. of protons, the greater and smaller magnetic moments corresponding with each mechanical moment may be calc. Results agree well with experiment. H. C. G.

Atomic structure. Y. MIMURA and T. IWATSUKI (J. Sci. Hiroshima Univ., 1937, A, 7, 259—261).—Theoretical. A method of treating at. structure on the analogy of Einstein's field theory of gravitation is suggested. O. D. S.

Hydrogen atom in terms of wave geometry. K. MORINAGA (J. Sci. Hiroshima Univ., 1937, A, 7, 263—304).—Mathematical. Both Schrödinger's and Dirac's level systems for the H atom are obtained by the application of the method of Mimura and Iwatsuki (cf. preceding abstract). O. D. S.

Fine structure formula of Sommerfeld and the electron spin. S. C. KAR (Z. Physik, 1937, 106, 418—422).—Theoretical. L. G. G.

Properties of certain vibratory doublets. E. T. JONES (Phil. Mag., 1937, [vii], 24, 458—466).—Theoretical. The common frequency of two electrons at various distances apart is considered. It is improbable that two electrons of opposite sign can, by direct approach, form a doublet. The energy of a moving doublet is considered, and comparison is made between its properties when moving with the velocity of light, and those of the photon. C. R. H.

e/m ratio as determined from the interval between corresponding components of H_α - and D_α -lines. R. C. GIBBS and R. C. WILLIAMS (Physical Rev., 1936, [ii], 49, 416).—An average val. of $\Delta\nu_{H-D} = 4.1470 \pm 0.0004$ cm.⁻¹ was obtained for the interval between the $2p^2P_{3/2} - 3d^2D_{5/2}$ components. This gives $(1.7577 \pm 0.0004) \times 10^7$ e.m.u. per g. for e/m and $(5.4908 \pm 0.0005) \times 10^{-4}$ ($^{16}O = 16$) for the at. wt. of the electron. L. S. T.

Image force in quantum mechanics. J. BARDEEN (Physical Rev., 1936, [ii], 49, 640). L. S. T.

Visible radiation produced by electrons moving in a medium with velocities exceeding that of light. P. A. TSCHERENKOV (Physical Rev., 1937, [ii], 52, 378—379; cf. this vol., 220).—The asymmetry of luminescence of the new radiation phenomenon was photographed for 10 different liquids and the inferences discussed are in agreement with theory. N. M. B.

New NH lines in the spectrum of the sun. M. NICOLET (Bull. Acad. roy. Belg., 1937, [v], 23, 646—652).—A list of new NH lines belonging to the (0, 0)

and (1, 1) bands of the resonance system ${}^3\Pi - {}^3\Sigma$ is given. F. J. L.

The system of bands ${}^2\Sigma - {}^2\Sigma$ of the molecule AlO and astrophysical applications. F. DEHALU (Bull. Acad. roy. Belg., 1937, [v], 23, 604—625).—The analysis of the structure of rotation of the series of bands ${}^2\Sigma - {}^2\Sigma$ of AlO shows predissociation in the band 0, 0 and perturbations in the bands 0, 0 and 0, 1. The upper limit of the heat of dissociation of AlO is 3.75 e.v., in good agreement with previous astrophysical observations. F. J. L.

Molecular dissociation in a stellar atmosphere P. LEDOUX (Bull. Acad. roy. Belg., 1937, [v], 23, 582—603).—Mathematical consideration of the dissociation of diat. mols. F. J. L.

Ultra-violet spectra of BeH and BeH⁺. W. W. WATSON and R. F. HUMPHREYS (Physical Rev., 1937, [ii], 52, 318—321).—A BeH band system analogous to the $B^2\Pi \rightarrow X^2\Sigma$ MgH system is reported. Observed bands are the (0, 0) at 1960, (1, 0) at 1882, and (1, 1) at 1956 Å., each consisting of a single Q branch. Data for the first of these and for the ${}^1\Sigma \rightarrow {}^1\Sigma$ BeH⁺ system are tabulated. The complex 3100—3600 Å. BeH spectrum consists only of an extension of the above BeH⁺ system. Analyses of the principal bands of the latter in this region yield revised vals. for the band consts. N. M. B.

Rotation isotope effect in band spectrum of cadmium hydride-deuteride. O. DEELE (Z. Physik, 1937, 106, 405—417).—Photographed 0—0 bands of the $2\Pi - {}^3\Sigma$ transition of CdD are compared with those of CdH and the influence of nuclear mass on rotation- and fine-structure is examined. It is shown in agreement with Van Vleck's formula that the spin separation for the ${}^2\Sigma$ term decreases with increased mass, the contrary holding for the 2Π term. L. G. G.

Band spectrum of thallium hydride. B. GRUNDSTRÖM (Nature, 1937, 140, 365—366).—Details of bands at 5680 Å. ($\Sigma - \Sigma$ transition?) and 6150 Å., obtained by heating Tl at 1500° in H₂ at 500 mm. pressure, are recorded. L. S. T.

Rotation analysis of the $0 \rightarrow 4$, $0 \rightarrow 5$, $1 \rightarrow 4$, and $1 \rightarrow 5$ bands of the III. pos. system of CO. B. S. BEER (Z. Physik, 1937, 107, 73—85; cf. A., 1936, 661).—The rotation analysis of the above bands is given and the nature of the perturbation in the various states discussed. H. C. G.

Structure of a new system of CO bands. R. SCHMID and L. GERÖ (Nature, 1937, 140, 508).—The new system previously reported (this vol., 164) is provisionally designated as $f^3\Sigma \rightarrow a^3\Pi$. L. S. T.

Vibration temperature in relation to rotation temperature in band spectra. N. R. TAWDE and S. A. TRIVEDI (Nature, 1937, 140, 463—464).—Gross intensities of the bands of the AlO blue-green and CN violet systems photographed simultaneously in the same arc have been measured by photographic spectral photometry. For the systems CN, $B^2\Sigma \rightarrow x^2\Sigma$ and AlO, ${}^2\Sigma \rightarrow {}^2\Sigma$ the calc. vibration temp. are 6200° and 3450° K., respectively; corresponding rotation temp. are 6500° and 3275° K. L. S. T.

Interpretation of the absorption spectra of crystals and solutions of rare-earth salts. C. B. ELLIS (Physical Rev., 1936, [ii], 49, 875; cf. A., 1936, 1448).—The first definite identification of the electronic transition causing the colour of a solid is claimed to have been made. Analysis of the data of Prandtl and of Spedding shows that the absorption lines of crystals and solutions of trivalent rare-earth salts are due to "forbidden" transitions between the ground state of the metal ion and the higher levels of the normal configuration, $4f^n$. The lowest excited terms, causing the longest wave bands, of Pr, Nd, Sm, Eu, Gd, Tb, Dy, and Ho are given. L. S. T.

Structure of fluorescence bands in aqueous solutions of terbium salts. A. ZAIDEL, N. KREMENEVSKI, and J. LARIONOV (Bull. Acad. Sci. U.R.S.S., 1937, Ser. Phys., 207—211).—The principal max. in the spectra of Tb₂(SO₄)₃, Tb₂(SeO₄)₃, TbCl₃, and TbBr₃ are at identical λ . TbCl₃ shows additional fluorescence max. in the yellow (TbBr₃ also) and green regions. J. S. A.

Absorption and luminescence spectra of uranyl salts and their solutions. V. L. LEVSHIN (Bull. Acad. Sci. U.R.S.S., 1937, Ser. Phys., 185—206).—The absorption spectra of cryst. UO₂SO₄·3H₂O, K₂UO₂(SO₄)₂·2H₂O, UO₂(NO₃)₂·6H₂O, UO₂(OAc)₂·2H₂O, and K₄UO₂(CO₃)₃ are similar in form, but the absorption max. are shifted to slightly different frequencies according to the anion present. The other cation in double salts has little influence on the spectra. The fluorescence and absorption spectra of the salts are complementary. Dissolution does not affect the position of the bands, but blurs the fine structure, as also does raising the temp. J. S. A.

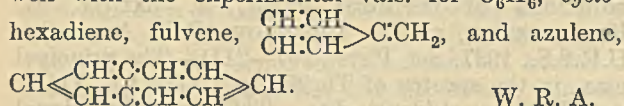
Absorption spectra of complex metallic salts of 2:2'-dipyridyl. K. YAMASAKI (Bull. Chem. Soc. Japan, 1937, 12, 390—394).—Spectra are recorded for [M(dipyridyl)₂]Cl₂ where M is Cu, Zn, Ni, Fe⁺⁺, and Co⁺⁺, and for [Co⁺⁺⁺(dipyridyl)₂]Cl₃, in aq. solution and in EtOH at 15°. At -60° to -70° in EtOH additional narrow bands were found. F. R. G.

Ultra-violet absorption spectra of deuterio-substituted methylamines. T. FÖRSTER and J. C. JUNGERS (Z. physikal. Chem., 1937, B, 36, 387—397).—A detailed account of work the principal results of which have already been published (this vol., 217). The appearance in high harmonics of the two fundamental frequencies which appear in the formula for the band frequencies indicates that both are to be ascribed to the excited state of the mol. Experiments on the introduction of D in NH₂Me have shown that only two H can be replaced, which excludes the structure CH₂NH₃ (cf. A., 1935, 1052). R. C.

Brillouin effect of benzene as obtained with the concave grating. D. H. RANK (Physical Rev., 1936, [ii], 49, 880).—Photographs of the 4358 and 3650 Å. lines of Hg scattered by C₆H₆ using a 21-ft. concave grating show the Brillouin components. L. S. T.

Theory of colour of organic compounds. A. L. SKLAR (J. Chem. Physics, 1937, 5, 669—681).—Visible and ultra-violet light is absorbed only when the

compound contains chromophoric groups. The alternation of single and double linkings in a chromophore enables several structural formulæ to be written for the mol. No single structural formula represents the mol. completely, but resonance between the various possible structures exists. Absorption bands will arise from resonance between the states corresponding with the different structures. Approx. calculations of the energy levels have been made using the Hund-Mulliken-Hückel and the Heitler-London-Slater-Pauling methods whereby only one parameter enters the calculations and is evaluated from the heats of hydrogenation, and no optical data are necessary. The absorption bands calc. by these methods agree well with the experimental vals. for C_6H_6 , cyclohexadiene, fulvene, $\begin{matrix} CH:CH \\ CH:CH \end{matrix} > C:CH_2$, and azulene,



W. R. A.

Absorption spectra of pyrrole colouring matters. (Pyrromethenes and bilirubinoids.) F. PRUCKNER and A. STERN (Z. physikal. Chem., 1937, 180, 25—43).—Between 240 and 700 $m\mu$, pyromethenes (I) have a characteristic spectrum of two bands, which are shifted towards the red by substituent alkyl groups and towards the blue by OH. COEt groups also cause a shift towards the red to an extent which varies with the position of the substituent and therefore serves to distinguish between isomerides. The spectra of salts of (I) with acids and complex salts with metals have two bands which are sharper and more intense than those of (I) but vary little with the acid. The principal bands of (I) and the ultra-violet bands of the corresponding porphyrins seem to be closely related. The absorption curve of urobilin (II) is similar to those of (I), but shifted towards the red. The curve of mesobilirubin (III) is shifted towards the blue compared with that of (II), due to the two OH, which are in the pyrrolenine nuclei. Salt formation by (II) and (III) has the same effect on the absorption as salt formation by (I), showing the presence in (II) and (III) of the (I) structure. It appears that the OH in the hydroxypyromethenes are in the pyrrolenine nucleus of the (I) system (cf. A., 1937, II, 168). The absorption curve of glaucobilin Me_2 ester differs completely from those of substances with the (I) structure.

R. C.

Quasi-crystalline structure of water from infra-red data. C. H. CARTWRIGHT (Physical Rev., 1936, [ii], 49, 421).—The transmission and reflexion measurements of liquid H_2O in the infra-red from 15 to 150 μ . show characteristics that appear to be due to a hindered rotation and hindered translation of the mols. as a whole in a quasi-cryst. structure. Intermol. binding energies of the H_2O mols. have been calc.

L. S. T.

Infra-red absorption spectrum of liquid water. D. WILLIAMS (Physical Rev., 1936, [ii], 49, 869).—New bands have been found at 6.8 μ . and near 8.6 μ . In the 3 μ . region, absorption is too intense for the satisfactory resolution of all of the separate max.

L. S. T.

Influence of certain ions on the structural temperature of liquid water. J. R. COLLINS and

C. MORAN (Physical Rev., 1936, [ii], 49, 875).—The changes in position and intensity of certain near infra-red absorption bands of liquid H_2O effected by the dissolution of metallic chlorides have been used to indicate the structural temp. of the H_2O in such solutions. Small ions (Li^+ , Mg^{++}) decrease, whilst large ions (Cs^+ , Ba^{++}) increase, this temp. L. S. T.

Optical properties of lithium fluoride crystals in the near infra-red. R. B. BARNES and L. G. BONNER (Physical Rev., 1936, [ii], 49, 648).—Transmissions determined in the region 1—15 μ . are compared with reflexion measurements from 10 to 33 μ . The existence of many secondary max. indicates a complex absorption structure in accordance with theory.

L. S. T.

Properties of crystal powders in the far infra-red. L. G. BONNER and R. B. BARNES (Physical Rev., 1936, [ii], 49, 648).—Christiansen transmission peaks, corresponding with the λ at which n of the crystal equals that of air, have been located in several of a no. of powdered cubic crystals examined in the region 34—126 μ .

L. S. T.

Molecular structure of BF_3 . C. R. BAILEY, J. B. HALE and J. W. THOMPSON (Proc. Roy. Soc., 1937, A, 161, 107—114).—The infra-red spectrum of BF_3 from 1 to 20 μ . has been recorded and fundamental frequencies, combination and overtones assigned. Comparison with Raman spectra shows the mol. to be planar. Force consts. have been calc. on this assumption, and the radius of the B atom is estimated.

G. D. P.

Infra-red absorption spectra of aqueous solutions of acetic acid and its chlorine derivatives. E. K. PLYLER and E. S. BARR (Physical Rev., 1936, [ii], 49, 868—869).—Intense absorption occurs from 4.5 to 6.0 μ . with aq. AcOH, $CH_2Cl\cdot CO_2H$, and $CCl_3\cdot CO_2H$ (I). In AcOH, max. absorption is at 5.75 μ . and in (I), at 5.4 μ ., the change being attributed to the larger dissociation in (I). For concns. from 0.25 to 8N, the coeff. of absorption, and hence the no. of absorbers, is not \propto concn.

L. S. T.

Infra-red dispersion of chloroform and bromoform. M. A. PITTMAN (Physical Rev., 1936, [ii], 49, 868).—Dispersion of $CHCl_3$ and $CHBr_3$ from visible light to approx. 12 μ . with particular attention to the C-H vibrations has been investigated.

L. S. T.

Spectrum of acetylene in the photographic infra-red. G. W. FUNKE and E. LINDHOLM (Z. Physik, 1937, 106, 518—531).—With an apparatus of increased light-gathering power, nine new bands in the rotation-vibration spectrum of C_2H_2 were examined. Several known bands were examined with increased dispersion and afforded further examples of levels with measurable Q-splitting. Accurate ν_0 vals. for the symmetrical deformation vibration were calc. from measurements on the bands at 7556 Å. and 9600 Å. The intensity formula derived by Dennison and others does not hold quantitatively for C_2H_2 . Approx. vals. for the work done in removing H atoms from the mol. were calc.; these indicate that the C-H linking is strengthened by the introduction of CH radicals into mols. such as C_2H_2 and HCN.

H. C. G.

Vibration spectra and molecular structure. III. Infra-red absorption spectra of *cyclopropane* and *ethylene oxide*. L. G. BONNER (J. Chem. Physics, 1937, 5, 704—706).—Infra-red spectra from 1 to 15.5 μ . for gaseous *cyclopropane* and $(\text{CH}_2)_2\text{O}$ and the Raman spectrum of liquid $(\text{CH}_2)_2\text{O}$ are recorded. W. R. A.

Infra-red absorption of nineteen hydrocarbons including ten of high mol. wt. F. W. ROSE, jun. (J. Res. Nat. Bur. Stand., 1937, 19, 143—161; cf. Liddel and Kasper, A., 1934, 238).—Absorption spectra have been measured from 5400 cm^{-1} to 8900 cm^{-1} of CCl_4 solutions of β -, γ -, δ -, and ϵ -methyl-nonane, PhPr^a , PhPr^b , $\gamma\epsilon\epsilon$ -trimethylheptane, $\gamma\delta\epsilon\epsilon$ -tetramethylhexane, ethyl*cyclohexane*, *n*-nonacosane ($\text{C}_{29}\text{H}_{60}$), and of the following hydrocarbons of high mol. wt. prepared by Mikeska (B., 1936, 1077): α -phenyl- and α -*cyclohexyl*-*n*-octadecane, ϵ -*cyclohexyl*-*n*-docosane, α -(7-tetrahydronaphthyl)-*n*-octadecane, ϵ -(7-tetrahydronaphthyl)-*n*-docosane and *n*- Δ^a -docosene, ϵ -(2-decahydronaphthyl)-*n*-docosane, α -(*p*-diphenyl)-*n*-octadecane, ϵ -(*p*-diphenyl)-*n*- Δ^a -docosene. The data are correlated with structural units of the hydrocarbons. O. D. S.

Infra-red absorption spectrum of deuterium-containing stearic acid. W. W. COBLENTZ and R. STAIR (Physical Rev., 1936, [ii], 49, 869).—A strong band at approx. 4.65 μ ., not present in stearic acid, has been observed. Other strong bands, present in both acids, occur at 2.4, 3.43, 3.8, 5.9, 6.86, 7.1, 7.7, 8.2, and 8.4 μ . L. S. T.

Raman spectra of deuterioethylenes. M. DE HEMPTINNE, J. JUNGERS, and J. DELFOSSE (Nature, 1937, 140, 323).—Lines observed and tabulated for C_2D_4 , $\text{C}_2\text{H}_3\text{D}$, C_2HD_3 , *cis*- and *trans*- $\text{C}_2\text{H}_2\text{D}_2$, and *as*- $\text{C}_2\text{H}_2\text{D}_2$ show a slight discrepancy with the calc. vals. of Manneback and Verleisen. L. S. T.

Chain vibrations of isomeric paraffins and their identification in the Raman spectrum. R. MECKE (Z. physikal. Chem., 1937, B, 36, 347—361).—The chain vibration frequencies of the first six paraffins have been calc. by the model method (this vol., 66), neglecting their interaction with deformation and CH-valency vibrations. From the results all the chain vibration frequencies in the Raman spectra have been identified. The type of chain-branching present may be determined from the val. of the smallest characteristic frequency, viz., >810 for normal chains, 790—820 for Bu^d derivatives, and 720—740 for Me_d derivatives. The entire Raman spectrum of a saturated hydrocarbon consists of four distinct regions: CH-valency vibrations (2800 to 3000), CH-deformation vibrations (1020 to 1460, +750), C-C valency vibrations (720 to 1000), and C-C flexural vibrations (<600). R. C.

Raman spectra of acid bromides. V. N. THATTE and B. V. THOSAR (Z. Physik, 1937, 106, 423—430).—Raman spectra of one aromatic and a no. of aliphatic bromoacyl bromides excited by 4358 Å. radiation are compared with results for corresponding Cl-derivatives. Shifts for characteristic C-halogen linkages are about 100 wave nos. less in the Br- than in the Cl-compounds. L. G. G.

Raman spectra of some chloroformates. M. S. JOGLEKAR (Phil. Mag., 1937, [vii], 24, 405—409).—Data for the Raman spectra of Me, Et, Pr, and CCl_3 chloroformate are given. The O:C:Cl group gives rise to two shifts 1783 and 476 cm^{-1} characteristic respectively of the C:O and C:Cl linkings. The frequency of the C:O group in O:C:Cl is the same for these compounds as for acid chlorides, but that for the C:Cl linking is different in these two classes of compounds. C. R. H.

Raman spectra of di-*n*-butyl ether and ethyl adipate. F. F. CLEVELAND and M. J. MURRAY (J. Chem. Physics, 1937, 5, 752).—The spectra are recorded and discussed. W. R. A.

Raman displacements in absorption and fluorescence bands of solutions. G. B. BANERJEA and B. MISHRA (Z. Physik, 1937, 106, 669—674).—Absorption and fluorescence bands of anthracene in EtOH, C_6H_6 , Et_2O , and *o*-xylene have been measured photometrically. On the hypothesis that the absorption band and the fluorescence band correspond respectively with exciting line and displaced band in Raman spectra, shifts have been observed and compared with corresponding infra-red frequencies from the Raman effect, good agreement being obtained. L. G. G.

Chemical applications of the Raman effect. I. Polymerisation. II. Common ion effect. J. H. HIBBEN (J. Chem. Physics, 1937, 5, 706—710, 710—712).—I. Raman spectra of Me methacrylate in the monomeric state and in different stages of polymerisation are discussed and compared with data for Me crotonate and *isocrotonate*. Unlike inorg. polymerides, those studied show some quite sharp lines. Polymerisation is accompanied by the disappearance of lines attributable to the C:C and :CH₂ linkings. The spectra of Et maleate and fumarate are also recorded and discussed.

II. As studied by the methods of Raman spectroscopy the ionisation of homopolar compounds appears to increase more rapidly than is to be expected by the amount of dilution. Addition of a common ion will repress this ionisation \propto the concn. of added common ion. Data for the Raman spectra of solutions of ZnCl_2 at different dilutions and the influence of added NaCl and ZnSO_4 are given and discussed. W. R. A.

Fluorescence of the chlorophyll series: fluorescence and photodecomposition of solutions of chlorophyll-*a* under oxygen, carbon dioxide, and nitrogen. H. V. KNORR and V. M. ALBERS (Physical Rev., 1936, [ii], 49, 420).—In COME_2 , max. on the densitometer curves occur at 679 and 647 $\text{m}\mu$. under O_2 , 677 and 646 $\text{m}\mu$. under CO_2 , and 679 and 648 $\text{m}\mu$. under N_2 . In C_6H_6 , corresponding max. are at 683 and 651 $\text{m}\mu$. under O_2 , 683 and 650 $\text{m}\mu$. under CO_2 , and 679 and 649 $\text{m}\mu$. under N_2 . The appearance of the fluorescence spectra for the COME_2 solutions during photodecomp. is quite different from that of the C_6H_6 solutions under the same gases. Stable conditions appear to be established in the C_6H_6 solutions since the intensity of the fluorescence is strong after exposure for many hr. to the radiation. The fluorescence in the COME_2 solutions under N_2

and CO_2 disappears after exposure for 2 hr. The appearance of additional max., and variation of the relative intensities of the max., indicate that solvent and atm. are determining factors in the photodecomp. of chlorophyll-*a*.
L. S. T.

Zinc sulphide-cadmium sulphide phosphors. K. KAMM (Ann. Physik, 1937, [v], 30, 333—353).—Phosphors activated by Cu and by Ag have been prepared from a complete range, 0—100% CdS, of ZnS-CdS mixtures. The intensity, spectral distribution, and period of luminescence of the phosphorescence are described.
O. D. S.

Cement phosphors. M. TRAVNÍČEK (Ann. Physik, 1937, [v], 30, 224—244; cf. A., 1933, 917).—Phosphors composed of fluorescein, aesculin, $p\text{-C}_6\text{H}_4(\text{CO}_2\text{H})_2$, carbazole, phenanthrene, and C_{10}H_8 added to a MgO cement containing MgCl_2 , MgI_2 , MgBr_2 , etc. are described. These phosphors have long periods of luminescence, 2 hr. for the oxychloride (I)-carbazole phosphor. It is deduced from the ignition loss of the (I) cement that the MgCl_2 is present as $\text{MgCl}\cdot\text{OH}\cdot\text{H}_2\text{O}$. The spectral distribution of the emitted light and its variation with λ of the exciting light are described. A reversible blue coloration is produced in (I)-carbazole phosphor by illumination. The variation of period of luminescence of MgOClBr - and MgOCl(KI) -carbazole phosphors with the ratio of Cl' to Br' or I' has been measured.
O. D. S.

Analysis of the conditions of excitation of electro-photoluminescent phenomena. G. DESTRIAU (J. Chim. phys., 1937, 34, 462—472; cf. this vol., 395).—Equations for the electric fields produced in a crystal of luminescent substance by applying to the crystal const., sinusoidal, and uniformly increasing fields are correlated with the data (*loc. cit.*). The luminescence depends not only on the rate of variation of the field but also on its abs. val. The conductivity increases in very intense fields.
J. G. A. G.

Ionising effect of cathode rays in different gases and gas mixtures. W. GERBES (Ann. Physik, 1937, [v], 30, 169—183).—Results for N_2 , O_2 , CO_2 , C_2H_6 , SO_2 , A, and Ne for cathode rays of 10—40 kv. are recorded and discussed. Measurements are also given for different $\text{C}_2\text{H}_6\text{-N}_2$ mixtures at 20 kv.
W. R. A.

Electrical and optical behaviour of half-conductors. XII. Inner photoelectric effect in crystalline cuprous oxide. G. FALTZ (Ann. Physik, 1937, [v], 30, 193—208).—The spectral yields of Cu_2O plates in electrolytic solutions have been investigated both for compensated and short-circuited currents. For the strongly-absorbed λ 436, 405, and 365 $\mu\mu$. an electron absorbs $h\nu$ but in the regions of weaker absorption at 546 and 578 $\mu\mu$. the yield is greatly diminished because of the stronger electron diffusion.
W. R. A.

Photo-conductivity and phosphorescence of zinc blende. A. L. REIMANN (Nature, 1937, 140, 501—502).—The resistance of Zn blende after excitation by blue light and "quenching" by infra-

red light is a linear function of time. The mechanism of photo-conduction is discussed.
L. S. T.

Electron conductivity and photochemical processes in alkali halide crystals. R. W. POHL (Proc. Physical Soc., 1937, 49, Extra Part, 3—31; cf. A., 1936, 139).—A comprehensive survey of the optical properties of pure alkali halide crystals and those containing a stoichiometric excess of one of the components, giving rise to colour centres; the motion of electrons released photo-electrically and thermally in the interior of these crystals, and the connexion between electron conductivity and ionic conductivity; and photo-chemical processes in the crystals and the optical and electrical measurement of photochemical yield.
N. M. B.

Trapped electrons in polar crystals. R. W. GURNEY and N. F. MOTT (Proc. Physical Soc., 1937, 49, Extra Part, 32—35).—Mathematical. An investigation of the properties and expected behaviour of an extra electron in a crystal without crystal imperfections, and the possible identification of these trapped electrons with *F* centres.
N. M. B.

Alkali halide phosphors containing heavy metals. R. HILSCH (Proc. Physical Soc., 1937, 49, Extra Part, 40—45).—A discussion of the absorption and emission spectra of phosphors obtained by adding small concns. of a heavy-metal halide to molten alkali halides and of the mol. complexes formed in the single crystals.
N. M. B.

Effects of temperature on the intensity of fluorescence of some impurity solids. J. T. RANDALL (Proc. Physical Soc., 1937, 49, Extra Part, 46—56).—A survey and discussion of measurements on the effects of temp. on the intensity of fluorescence of various forms of ZnS, CdS-ZnS, and $\text{CdI}_2\text{-Al}_2\text{O}_3$ containing traces of various metallic impurities, and the relation of results to the theory of semi-conductors.
N. M. B.

Semi-conductors with partially and with completely filled 3d-lattice bands. J. H. DE BOER and E. J. W. VERWEY (Proc. Physical Soc., 1937, 49, Extra Part, 59—71).—An explanation of the lack of conductivity, if the no. of electrons per atom is an integer, of a class of semi-conductors or insulators with incompletely filled 3d bands. The discussion and the removal of the integral restriction are illustrated by reference to NiO , Cu_2O , and ZnO .
N. M. B.

Structure of thin metallic films. G. I. FINCH (Proc. Physical Soc., 1937, 49, Extra Part, 113—117).—An account of the structural features, as revealed by electron diffraction, which cause or contribute to the abnormally low conductance of thin metallic films.
N. M. B.

Factors influencing the resistance of thin metal films. E. T. S. APPELYARD (Proc. Physical Soc., 1937, 49, Extra Part, 118—135; cf. this vol., 291).—An account of the deposition and investigation of coherent films of alkali metals <50 Å. thick on glass, and variations of experimental conditions to give films of any desired resistivity from the low val. shown by the coherent films to vals. 10^5 times as

great. Evidence is given that this high resistance is due to granulation or agglomeration of the film.

N. M. B.

Electrical properties of thin films of platinum obtained by cathode sputtering in air and other gases (He , N_2 , O_2 , and H_2). A. FÉRY (Proc. Physical Soc., 1937, 49, Extra Part, 136—137).—In view of discordant vals. of resistivity and crit. thickness of Pt films, investigations are reported of deposits made with special precautions and without heating the substrate. The films are of Pt-black, and on heating in vac. undergo a series of alternate reversible and irreversible resistivity changes with a series of crit. thresholds and transition points. At 340° the resistance corresponds with that for white Pt and a new curve is obtained with crit. thickness near 50 μ , but at thickness 3—6 μ , the curve joins up with that of Pt-black. The resistance variation of deposits formed in the simple gases is discussed.

N. M. B.

Fluctuations in the resistance of thin films. J. BERNAMONT (Proc. Physical Soc., 1937, 49, Extra Part, 138—139).—A summary of mathematical expressions for available data and theory.

N. M. B.

Migration and aggregation of atoms on solid surfaces. J. E. LENNARD-JONES (Proc. Physical Soc., 1937, 49, Extra Part, 140—150).—Mathematical.

N. M. B.

Measurement of conductivity and p_H . Application to pure water. R. CLIQUET-PLYEL (Document sci., 1935, 4, 104—113; Chem. Zentr., 1936, i, 3652).—The val. 0.04×10^{-4} for the conductivity of pure H_2O is in agreement with theoretical considerations. The p_H of H_2O saturated with air, and hence containing CO_2 , is taken as 5.8.

J. S. A.

Conductivity measurements and p_H measurements. A. KLING and A. LASSIEUR (Document sci., 1935, 4, 225—229; Chem. Zentr., 1936, i, 3652—3653).—The conclusions of Clquet-Pleyel (preceding abstract) are disputed.

J. S. A.

Discharge of a condenser through a tube of gas. M. LAPORTE (J. Phys. Radium, 1937, [vii], 8, 332—342).—The discharge of a condenser through a tube of gas is analogous to the discharge through a metal resistance.

F. J. L.

Electric moments of dioxans and dioxolans. M. M. OTTO (J. Amer. Chem. Soc., 1937, 59, 1590—1592).—Electric moments have been determined for 2-methyl-, 2:4-dimethyl-, 2:4:4:5:5-pentamethyl-, 2-bromomethyl-, and 2:2-dimethyl-1:3-dioxolan (1.21, 1.32, 1.29, 2.28, and 1.12×10^{-18}) and for 2-methyl-, 2-methyl-2-amy-, and 2-bromo-methyl-1:3-dioxan (1.89, 1.90, and 2.89×10^{-18}). The results are discussed.

E. S. H.

Molecular volumes and expansivities of liquid normal hydrogen and para-hydrogen. R. B. SCOTT and F. G. BRICKWEDDE (J. Chem. Physics, 1937, 5, 736—744).—Measurements of mol. vols. and expansivities of liquid n - and p - H_2 between 14° and 20.4° K. with a fused quartz dilatometer show that the changes in mol. vol. and lattice energies of H_2 in passing from the mol. rotational state (o - H_2) to the

non-rotational state (p - H_2) are opposite in direction to those observed for the same changes in other substances. The state of non-rotating p - H_2 is fundamentally similar to that of rotation in other substances at high temp. These differences are due to a difference in magnitude and symmetry of the intermol. forces of repulsion arising from the distribution of the average electron density of o - H_2 and p - H_2 .

W. R. A.

Absorption of centimetre waves in liquids and solutions. D. ELLE (Ann. Physik, 1937, [v], 30, 354—370).—Measurements have been made at λ 4 cm. for glass, C_6H_6 , cyclohexane, EtOH, glycerol containing varying % of H_2O , aq. solutions of fructose and of HCl, NaCl, and BaCl_2 . The absorptions of glass, C_6H_6 , and cyclohexane are small and approx. equal. The refractive index, n , of glass is 2.67 ± 0.05 and agrees with the val. of Rubens. C_6H_6 has $n^{18} 1.48 \pm 0.02$, which is equal within experimental error to $\epsilon^{\frac{1}{2}}$. The transition λ , λ_c , of EtOH and H_2O are calc. from their absorption coeffs. Vals. disagree with those of von Ardenne *et al.* (A., 1936, 1182). A max. absorption was observed in fructose solutions at 33% fructose. λ_c calc. at this concn. agrees with the val. of Wien for 33.3% sucrose solution (this vol., 65). The variation in absorption of the electrolyte solutions with temp. and concn. (1—5N) was followed, and λ_c of H_2O at 18° is calc. and agrees with the val. of Schmelzer (*ibid.*, 65).

O. D. S.

Magnetic rotation spectra of polyatomic molecules in the ultra-violet. P. KUSCH and F. W. LOOMIS (Physical Rev., 1936, [ii], 49, 879—880).

L. S. T.

Magneto-optical dispersion of organic liquids in the ultra-violet region of the spectrum. XI. Magneto-optical dispersion of methyl malonate, isopropyl propionate, isopropyl butyrate, ethyl isobutyrate, and *tert.*-butyl alcohol. C. J. MARSDEN and E. J. EVANS (Phil. Mag., 1937, [vii], 24, 377—395).—Vals. for n and magneto-optical rotation are recorded. The magneto-optical dispersion can be represented by $n\delta = K\lambda^2/(\lambda^2 - \lambda_1^2)^2$, where δ is Verdet's const. for wave-length λ , λ_1 is the wave-length of the absorption band in the Schumann-Lyman region, and K is a const. For compounds of similar structure the addition of CH_2 increases the val. of λ_1 by approx. 0.0012 μ . The vals. of λ_1 for Bu^oOH , Bu^sOH , and Bu^tOH are approx. the same. n - and *iso*-esters of the same empirical formula also have approx. the same vals. of λ_1 . The data are discussed in relation to Larmor's theory of magnetic rotation.

C. R. H.

Calculation of the energy of H_2 and H_3^+ . III. J. HIRSCHFELDER, H. DIAMOND, and H. EYRING (J. Chem. Physics, 1937, 5, 695—703).—Mathematical. The energy of H_2 and of H_3^+ previously calc. (A., 1936, 411) by the variational method for symmetrical linear configurations is now obtained for two linear unsymmetrical configurations. The activated state for the reaction $\text{H} + \text{H}_2$ is located as the symmetrical linear configuration, whilst, employing semi-empirical methods, the activated state is unsymmetrical.

For the symmetrical configuration H_3^+ has min. energy. Linear vibration frequencies are calc.

W. R. A.

Specific oscillations of tetrahedral molecules.

E. A. HYLLERAAS (Z. Physik, 1937, 107, 86—90).—On the assumption that the central atom A , in a mol. AB_4 , exerts attractive forces on the B atoms and that the B atoms mutually repel, sp. oscillations and the corresponding sp. frequencies are derived mathematically.

L. G. G.

Electron affinity of the hydroxyl group. II.

J. GOUBEAU and W. KLEMM (Z. physikal. Chem., 1937, B, 36, 362—370).—The lattice energies of the alkali hydroxides have been calc. by a method more precise than that used previously (this vol., 115). The results indicate that NaOH, KOH, RbOH, and CsOH have co-ordinated lattices similar to that of NaCl. The energy of hydration of the OH^- ion is < that of the F^- ion by 2 kg.-cal., and the electron affinity of OH is 48 kg.-cal.

R. C.

Calculation of the rotation constants of diatomic molecular terms from perturbation data.

I. KOVÁCS (Z. Physik, 1937, 106, 431—438).—Theoretical. Rotation and vibration consts. of $I^2\Sigma$ terms may be calc. from perturbation of the $A^{1\Pi}$ terms.

H. C. G.

Stability of degenerate electronic states in polyatomic molecules. H. JAHN and E. TELLER (Physical Rev., 1936, [ii], 49, 874).

L. S. T.

Stability of polyatomic molecules in degenerate electronic states. I. Orbital degeneracy.

H. A. JAHN and E. TELLER (Proc. Roy. Soc., 1937, A, 161, 220—235).—Orbital electronic degeneracy and stability of nuclear configuration are shown to be incompatible unless all the atoms of the mol. lie in a straight line. Results are tabulated showing the no. of proper vibrations of a given symmetry type for any polyat. mol. Only slight instability results if the electrons causing degeneracy are not essential for mol. binding.

G. D. P.

Energy bands of crystals. (A) Effect of time-reversal symmetry. (B) Accidental degeneracy. C. HERRING (Physical Rev., 1937, [ii], 52, 361—365, 365—373).—Mathematical.

N. M. B.

Atomic forces of solid state. VI. Non-metals. W. WEN-PO (Phil. Mag., 1937, [vii], 24, 466—472).—Mathematical. At. vibrational frequency is considered in relation to sp. heat, compressibility, m.p., thermal expansion, and surface tension formulæ.

C. R. H.

Lattice energy of solid carbon dioxide. H. SPONER and M. BRUCH-WILLSTÄTTER (J. Chem. Physics, 1937, 5, 745—751).—Mathematical. The London theory of van der Waals forces gives a fair representation of the sublimation heat of solid CO_2 .

W. R. A.

Lattice energies and transition temperatures of caesium chloride and ammonium chloride. A. MAX (Physical Rev., 1937, [iii], 52, 339—347).—The lattice energies of CsCl and NH_4Cl are calc. by the Born-Mayer method for both the CsCl and NaCl type lattices, and the temp. of transition between these two forms are determined from the equality

of the free energies with the help of the elastic consts. and proper frequencies. Calc. transition temp. are in only rough qual. agreement with experimental vals.

N. M. B.

Wave functions in halite. W. SHOCKLEY (Physical Rev., 1936, [ii], 49, 874).—The Wigner-Seitz method of cellular potentials has been applied to the calculation of wave functions in NaCl.

L. S. T.

Surface tension of mercury in presence of nitrogen, hydrogen, and carbon dioxide. M. KERNAGHAN (Physical Rev., 1936, [ii], 49, 414; cf. A., 1936, 1053).—Data for pressures up to 300 mm. are recorded.

L. S. T.

Parachor studies at various temperatures.

C. A. BUEHLER, T. S. GARDNER, and M. L. CLEMENS (J. Org. Chem., 1937, 2, 167—174).—[P] of the co-ordinate compounds $EtNO_3$, Et_2SO_3 , Et_2SO_4 , $PhSO_2Cl$, $p-C_6H_4Me\cdot SO_3Me$, $p-C_6H_4Me\cdot SO_2Cl$, and SO_2Cl_2 is determined, at several temp. for each. At lower temp., e.g., 40° or 70°, there is a negative deviation from Sugden's calc. [P], but at higher temp. a positive deviation. The anomaly is not due to association: the substances have not the character of associated liquids, and the val. of the Ramsay-Shields-Eötvös const. for each is near to 2.12. From the temp. effect a distinction may be made between the co-ordinate and the covalent linkage. [P] of o -, m -, and p - $NO_2\cdot C_6H_4\cdot OH$, of o -, m -, and p - $OH\cdot C_6H_4\cdot CO_2Me$, of o -, m -, and p - $OH\cdot C_6H_4\cdot CHO$, and of o - and p - $C_6H_4Ac\cdot OH$ is also determined. In the o -compounds, containing a chelate linkage (A., 1930, 1240), [P] has a negative val., from -10.8 to -14.2, with no temp. coeff.; the remainder have [P] increasing with temp.

E. W. W.

Small-angle X-ray scattering. B. E. WARREN (Physical Rev., 1936, [ii], 49, 885).—Results obtained with fine-grained SiO_2 flour are described. The application of the effect to the measurement of particle size is discussed.

L. S. T.

Determination of the size and shape of crystal particles by X-rays. A. L. PATTERSON (Physical Rev., 1936, [ii], 49, 884).—X-Ray interference functions for particles of very general shapes can be obtained by a new method based on Fourier analysis. Bragg's method is used to discuss the problem of the shape of particles from X-ray data.

L. S. T.

Fourier analysis of X-ray scattering from polyatomic liquids. W. C. PIERCE (J. Chem. Physics, 1937, 5, 717—720).—A simplified form of the Fourier integral analysis of the X-ray scattering of polyat. liquids containing like atoms is discussed and applied to Katsoff's data for C_6H_6 (A., 1935, 152). The distribution function thus obtained indicates that a given mol. is surrounded by six oriented neighbours in the plane of the ring and that the mean separation of centres is approx. 6.7 Å. Parallel planes of flat mols. are separated by 3.7 Å. The structure closely resembles the crystal structure of C_6Me_6 .

W. R. A.

Effect of discontinuities of the background on the evaluation of the intensities of X-ray reflexions from crystalline powders. A. BAXTER and J. C. M.

BRENTANO (Phil. Mag., 1937, [vii], 24, 473—492).—A general discussion of means of avoiding errors arising from background discontinuities due, principally, to absorption steps and to sudden sensitivity changes of the photographic emulsion for certain $\lambda\lambda$. The selection of lines free from interference is considered preferable to averaging measurements from a no. of lines. C. R. H.

Debye-Waller temperature factor for anisotropic crystals. E. O. WOLLAN (Physical Rev., 1936, [ii], 49, 422).—The apparently anomalous X-ray reflecting power of Zn (A., 1936, 3) is in accord with the predictions of the Debye-Waller theory as extended by Zener (A., 1936, 273) to anisotropic crystals. L. S. T.

Recrystallisation of bent drawn aluminium wire. T. HUDITA (J. Sci. Hiroshima Univ., 1937, A, 7, 323—326).—The structure at the point of max. curvature of a bent Al wire has been observed, after recrystallisation, by means of convergent X-rays. Recrystallisation is not perfect. O. D. S.

Effect of stress on the X-ray spectral line obtained with a single-crystal wire of tungsten by using the method of convergent X-rays. T. FUJIWARA (J. Sci. Hiroshima Univ., 1937, A, 7, 315—321).—Indications of elastic distortion of the crystal lattice and of small bodily movements were observed on stretching. O. D. S.

Exchange of energy between a platinum surface and helium atoms and its dependence on the structure of the surface. W. B. MANN (Proc. Roy. Soc., 1937, A, 161, 236—247).—An electron diffraction investigation of the thin protective film formed on Pt by heating in O_2 shows that the film has a body-centred tetragonal structure, a 5.38, c 4.43 Å. Its chemical composition is not known (cf. A., 1935, 8). G. D. P.

Theory of Brillouin zones and symmetry properties of wave functions in crystals. L. BOUCKAERT and R. SMOLUCHOWSKI (Physical Rev., 1936, [ii], 49, 875). L. S. T.

Asymmetry in metals of hexagonal structure. G. W. BRINDLEY and P. RIDLEY (Nature, 1937, 140, 461—462).—A discussion of the two kinds of asymmetry, viz., that of the lattice vibrations and that of the atoms, found in certain metals, particularly Zn and Cd, having a hexagonal structure. Evidence for a different type of asymmetry in Ru, due to a concn. of electron density of the kind illustrated, has been obtained. L. S. T.

Amorphous state of metals. J. KRAMER (Z. Physik, 1937, 106, 675—691; cf. A., 1934, 244).—The prep. of amorphous metals is described, and their properties and the mechanism of transition from the amorphous to the cryst. state are discussed. L. G. G.

Structure of thin metallic layers. J. KRAMER (Z. Physik., 1937, 106, 692—701; cf. preceding abstract).—The relation between transition temp. and the geometry of the metallic layer is considered. L. G. G.

Thickness of silver chloride film produced on the surface of a silver plate. S. SHIMADZU (Mem. Coll. Sci. Kyoto, 1936, 19, A, 229—236; cf. A., 1935, 918).—The thickness of AgCl films formed on thin Ag plates immersed in HOCl is determined by comparing the intensity of the (220) AgCl X-ray reflexion with the (200) Ag reflexion. The influence of temp., [HOCl], and size of the Ag grains on the rate of formation of the AgCl film is investigated. F. J. L.

The swarm theory of liquid crystals. R. FÜRTH and K. SITTE (Ann. Physik, 1937, [v], 30, 388—400).—The swarm theory is preferred to the continuum theory. Four independent methods of calculation, from measurements of the effect of magnetic fields on the dielectric const. of liquid crystals and from the results of Tropper (cf. this vol., 555), give vals. of swarm dimensions between 2.5×10^{-5} and 4×10^{-5} cm. O. D. S.

Possibility of formation of small crystals in melts at temperatures above the melting points. R. KAISCHEV (Ann. Physik, 1937, [v], 30, 184—192).—The possibility of small crystals (sub-nuclei) forming in melts at temp. $>$ m.p. is theoretically considered. W. R. A.

X-ray scattering in molten salts. I. K. LARK-HOROVITZ and E. P. MILLER (Physical Rev., 1936, [ii], 49, 418).—Diffraction patterns from molten LiCl, LiBr, NaCl, and KCl have been obtained with monochromatic Ag $K\alpha$ radiation. The patterns of LiCl and LiBr are sharper than the patterns usually observed in liquids. NaCl yields a diffuse pattern, which is much less sharp than that of KCl. In the KCl crystal any atom has 6 equiv. neighbours in a distance of 3.14 Å. and 12 in one of 4.44 Å. L. S. T.

Stereochemistry of quadricovalent atoms: cobalt and manganese. E. G. COX, A. J. SHORTER, W. WARDLAW, and W. J. R. WAY (J.C.S., 1937, 1556—1559).—Cryoscopic and ebullioscopic determinations show that both α - and β - $CoCl_2 \cdot 2C_5H_5N$ are unimol. X-Ray analysis shows that the α -form possesses a planar *trans*-configuration. This fact, in conjunction with the known tetrahedral structure of $[CoCl_4]^{2-}$, provides the first instance of a bivalent metal having unchelated quadricovalent derivatives of $>$ one configuration. The β -form is isomorphous with the only known forms of $CoBr_2 \cdot 2C_5H_5N$ and $CoI_2 \cdot 2C_5H_5N$, but its structure is uncertain. $MnCl_2 \cdot 2C_5H_5N$ is isomorphous with $CoCl_2 \cdot 2C_5H_5N$ and has a planar structure. A. J. M.

Isomorphism and supersaturation. L. J. KLINKENBERG (Chem. Weekblad, 1937, 34, 617—619).—The development of the idea of isomorphism and its definition, especially in connexion with the X-ray analysis of crystals, is discussed. Experiments with supersaturated solutions of $KClO_4$ and NH_4ClO_4 seeded with $BaCrO_4$, $BaSO_4$, $BaWO_4$, $BaMoO_4$, and $PbSO_4$ show that $BaCrO_4$ is most effective in bringing about crystallisation. S. C.

Dehydration nuclei on crystals of copper sulphate pentahydrate. W. E. GARNER and H. V. PIKE (J.C.S., 1937, 1565—1568; cf. A., 1935,

151).—The shapes of the dehydration nuclei on the 110, 120, 010, 110, 100, 021, 111, 021, and 121 faces of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ have been investigated. The prominent directions of growth are in definite crystal planes, particularly 010. This is discussed in connexion with the arrangement of Cu^{2+} , SO_4^{2-} , and H_2O in the crystal lattice (A., 1934, 243). The shapes of the dehydration nuclei are dependent on the activation energy for removal of H_2O mols., variable with direction, the collapse of the lattice, hindering the escape of H_2O in certain directions, and the curvature of the interface, affecting the rate of recombination of H_2O .

A. J. M.

Salts of hexahydrated cations. II. Magnesium chlorite hexahydrate. A. FERRARI and C. COLLA (Gazzetta, 1937, 67, 424–428; cf. this vol., 502).— $\text{Mg}(\text{ClO}_2)_2 \cdot 6\text{H}_2\text{O}$ belongs to the tetragonal system, 4 mols. per unit cell, a 10.29, c 10.55 Å., and its structure is analogous to that of $\text{Mg}(\text{H}_2\text{PO}_2)_2 \cdot 6\text{H}_2\text{O}$. The structure of the ClO_2^- anion agrees with the Lewis-Langmuir octet theory.

O. J. W.

X-Ray study of the systems $\text{CaO-Al}_2\text{O}_3$ and $\text{SrO-Al}_2\text{O}_3$. K. LAGERQVIST, S. WALLMARK, and A. WESTGREN (Z. anorg. Chem., 1937, 234, 1–16).—There are five Ca aluminates and four Sr aluminates which are exactly analogous to four of the Ca compounds. $3\text{Ca}(\text{Sr})\text{O} \cdot \text{Al}_2\text{O}_3$ have simple cubic lattices with a 15.22 and 15.79 Å., respectively, instead of the smaller dimensions given by Steele and Davey (A., 1929, 1131). $12\text{CaO} \cdot 7\text{Al}_2\text{O}_3$ is body-centred cubic, a 11.95 Å., as found by Bussem and Eitel (this vol., 288), but an alternative interpretation of the structure, corresponding with the formula $9\text{CaO} \cdot 5\text{Al}_2\text{O}_3$, is possible. $\text{Ca}(\text{Sr})\text{O} \cdot \text{Al}_2\text{O}_3$ have a low degree of symmetry, and the lattice dimensions could not be determined. $\text{Ca}(\text{Sr})\text{O} \cdot 2\text{Al}_2\text{O}_3$ are monoclinic, with a 12.82, b 8.84, c 5.42 Å., β 107.8° and a 12.94, b 9.00, c 5.54 Å., β 106.3°, respectively. $3\text{Ca}(\text{Sr})\text{O} \cdot 16\text{Al}_2\text{O}_3$ are isomorphous with $\beta\text{-Al}_2\text{O}_3$, and have a 5.536, c 21.825 Å. and a 5.557, c 21.945 Å., respectively.

F. J. G.

Crystal-forms of complex salts of triaminopropane with trivalent cobalt and rhodium. P. TERPSTRA and J. TER BERG (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 602–606).—Crystallographic data are recorded for the following: triaminopropane hydrochloride + H_2O , $\{\text{Co}(\text{tpn})_2\}\text{Cl}_3$, $\{\text{Co}(\text{tpn})_2\}\text{Br}_3$, $\{\text{Co}(\text{tpn})_2\}\text{I}_3$, space-group probably D_{3d} , $\{\text{Co}(\text{tpn})_2\}(\text{SCN})_3$, $\{\text{Rh}(\text{tpn})_2\}\text{Cl}_3$, $\{\text{Rh}(\text{tpn})_2\}\text{Br}_3$, and $\{\text{Rh}(\text{tpn})_2\}\text{I}_3$ (tpn = triaminopropane). J. G. A. G.

Structure of organic molecules by X-ray analysis. J. M. ROBERTSON (Sci. Progr., 1937, 32, 246–265).—A review.

Structure of the guanidinium ion compared with borates, carbonates, and nitrates. W. THIELACKER (Fortschr. Min., 1936, 20, 64–66; Chem. Zentr., 1936, i, 3663).—Investigation of guanidinium halides shows that the ion $\text{C}(\text{NH}_2)_3^+$ is planar, the NH_2 being situated at the corners of an equilateral triangle with the C in the centre; in the iodide the diameter of the NH_2 group is 1.49 Å. In compounds of the type $A(\text{BX})_3$, r_A/r_X has the val. 0.41–0.75 if A has co-ordination no. 6, 0.73–1.00 if this is 8, and higher vals. if it is 12. It is concluded

that the co-ordination no. is 8 in guanidinium bromide and 12 in the iodide.

H. N. R.

Fibrous structure of paraffin. H. RIJUSAN (Mem. Coll. Sci. Kyoto, 1936, 19, A, 279–282).—The fibre structure of paraffin drawn into the form of a wire is practically unaffected by heat-treatment at < m.p.

F. J. L.

Structure of *o*-diphenylbenzene ($\text{C}_{18}\text{H}_{14}$). C. J. B. CLEWS and K. LONSDALE (Proc. Roy. Soc., 1937, A, 161, 493–504).—The crystals are orthorhombic, space-group $P2_12_12_1$, having 4 mols., $\text{C}_{18}\text{H}_{14}$, in each unit cell. d^{16} 1.166 g. per c.c.; the parameters of the cell are 18.6, 6.05, and 11.8 Å. Measurement of the intensity of X-ray reflexions gave no clear indication of the mol. structure. Conclusions as to the orientations of the mols. are drawn from the principal diamagnetic susceptibilities. The most likely structure is that in which two Ph groups have their planes turned in the same direction, about 50° out of the plane of the C_6H_4 nucleus.

G. D. P.

Hydrogen bridges in solid pentaerythritol. I. NITTA and T. WATANABÉ (Nature, 1937, 140, 365).—A quant. crystal analysis by the method of Fourier series shows that the space-group is S_6^2-14 (cf. A., 1926, 665). The central C is at 000, and is surrounded tetrahedrally by the four methylenic C at xyz , xyz , $y\bar{x}\bar{z}$, and $\bar{y}xz$ with x 0.165, y 0.140, and z 0.10, giving 1.57 Å. for interat. distance of the C—C linking. The four hydroxyl O are arranged so that the parameters x , y , and z are 0.313, 0.265, and 0.00, respectively, giving 1.46 Å. for the C—O linking distance. The O lie in the same plane $z = 0$ as the central C. If the H of the OH are disregarded, the mol. possesses approx. the symmetry of $D_{2d}-42m$ with one pair of primary alcohol radicals puckered upwards and the other downwards, all the bond angles of these atoms being approx. tetrahedral. The most interesting feature of the structure is the close approach of the OH on adjoining mols. In the plane $z = 0$, four O, one from each mol., form a square of side 2.55 Å., and this val. for the O—O distance, which must be bridged by an H, is < that assigned by Bernal and Megaw to their “hydroxyl bond” (A., 1935, 1307). The mols. in a layer parallel to (001) are linked more or less firmly to each other by H bridges in closed rings.

L. S. T.

Crystal structure of cellulose. E. SAUTER (Z. physikal. Chem., 1937, B, 36, 427–434).—A reply to criticism (this vol., 562).

R. C.

X-Ray investigations of additive compounds of cholesterol.—See A., II, 416.

Structure of polyvinyl acetate. L. MISCH and L. PICKEN (Z. physikal. Chem., 1937, B, 36, 398–404).—The elastic properties, optical behaviour, and X-ray diagram indicate that polyvinyl acetate is similar in structure to vulcanised rubber and consists of a loose network of mol. chains in the interstices of which free chains are embedded. On stretching above 50° the chains assume a parallel orientation, but crystallisation does not occur. The high reversible extensibility and slight increase with the extension of the modulus of elasticity indicate that the chains must be long.

R. C.

Highly polymerised compounds. CLXIV. Unit cell diagrams and micro-structure of "single crystals" of rubber. Determination of the macromolecular lattice of rubber by new X-ray methods. E. SAUTER (Z. physikal. Chem., 1937, B, 36, 405—426; cf. A., 1936, 1327).—The macromol. lattice of rubber is rhombic and has a 12.60 ± 0.05 , c 8.91 ± 0.05 , b 8.20 ± 0.05 Å. and 8 isoprene groups in the unit cell. The four chains of mols. which pass through the unit cell in the direction of the fibre axis are probably trough-shaped and contracted into a columnar form, the double linkings being in *cis* positions. When "melted" rubber crystallises at room temp., due to considerable extension, there is partial separation, crystallites surrounded by a loose amorphous skin being formed. The function of gas-black as filler is to prevent the formation of cryst. regions of appreciable size.

R. C.

Electron diffraction studies of oxides formed on iron. T. IMORI (Nature, 1937, 140, 278).—The regions of stability of FeO, Fe₃O₄, and Fe₂O₃ formed on Fe in air at different temp. and pressures, as determined by electron diffraction, are given. The facts that lower oxides are formed at higher temp. under reduced pressure, and that prolonged exposure increases the scale thickness and not the degree of oxidation, indicate that Fe atoms migrate more vigorously towards the surface with a rise in temp. and inhibit further oxidation of the lower oxides. The transition temp. between γ - and α -Fe₂O₃ lies at approx. 340°, and near this temp. both oxides are formed in an amorphous condition. The change α - to γ -Fe₂O₃ has been effected by maintaining this amorphous α -Fe₂O₃ at 330°.

L. S. T.

Electron diffraction in germanium iodide and stannic iodide vapour. J. A. HVEDING and L. C. STRØMME (Tids. Kjemi, 1937, 17, 81—83).—Visual intensity estimates confirm the tetrahedral configurations of GeI₄ and SnI₄.

M. H. M. A.

Molecular structures of the bromomethanes. H. A. LÉVY and L. O. BROCKWAY (J. Amer. Chem. Soc., 1937, 59, 1662—1665).—Electron-diffraction investigation shows that the C—Br distance is 1.91 Å. in each compound; the Br—C—Br angle is 109° 28' in CBr₄, 111° in CHBr₃, and 112° in CH₂Br₂. E. S. H.

Natural magnetism of crystals. F. KRUGER and F. BRASACK (Ann. Physik, 1937, [v], 30, 113—135).—Natural magnetism in crystals of certain structure can be predicted and various types of crystal structure are reviewed. A new method of measuring natural magnetism is described and results are given for two specimens of gypsum of different origin and containing about 0.00015% of Fe. The incompatibility of the existence of natural magnetism and diamagnetic permeability in gypsum is discussed.

W. R. A.

Precise magnetic torque measurements on single crystals of iron. L. P. TARASOV and F. BITTER (Physical Rev., 1937, [ii], 52, 352—360).—With a view of developing magnetic measurements for studying grain orientation of ferromagnetics and to interpret magnetic properties of polycryst. aggregates, magnetic torque curves are obtained for single-

crystal discs. Errors arising from the use of cylindrical discs may be avoided by using ellipsoids. The experimental and calc. curves for a single-crystal ellipsoid of 2.8% Si-Fe are in good agreement.

N. M. B.

Fluctuation phenomena in liquid crystals. H. TROPPER (Ann. Physik, 1937, [v], 30, 371—387).—The variations in brightness of a thin film of the anisotropic phase of *p*-acetoxybenzylideneazine when illuminated with a parallel beam of plane-polarised light and viewed through a Nicol prism in the position of extinction have been recorded by means of a microcine-camera. The effects of temp. and of magnetic field with lines of force parallel to the direction of observation have been investigated. Results are analysed and are shown to be in accordance with the swarm theory of liquid crystals.

O. D. S.

Optical rotation and rotatory dispersion in solution and in the crystalline state. F. M. JAEGER, J. TER BERG, and P. TERPSTRA (Proc. K. Akad. Wetensch. Amsterdam, 1937, 40, 574—579; cf. this vol. 289).—The $[\alpha]$ of crystals and solutions of *L*-{Co(*d*-chxn)₃}Cl₃·4H₂O and *L*-{Cr(*d*-chxn)₃}Cl₃·3H₂O (chxn = 1 : 2-diaminocyclohexane) have been determined at 4930—6650 Å. At these λ , the crystals are dextrorotatory, but the solutions are dextrorotatory only at some of the shorter λ . The λ of the max. rotation in solution coincides with that of the corresponding crystal. Longchambon's "rule," $[\alpha_{\text{sol.}}]_{\lambda_1}/[\alpha_{\text{cryst.}}]_{\lambda_1} = \text{const.}$, does not apply to these data.

J. G. A. G.

Optical constants of liquid sodium amalgams. A. P. FRIESEN (Physical Rev., 1936, [ii], 49, 414).—With 44 amalgams (0 to 40 at.-% Hg) large changes in $n^2 - k^2$ and in $2nk$ with a change in concn. occur in the region of concns. where so-called intermetallic compounds exist. More or less periodic, small changes also occur where compounds are known not to exist.

L. S. T.

Optics of thin metal films. H. WOLTER (Z. Physik, 1937, 106, 540).—A correction (cf. this vol., 402).

H. C. G.

Optical investigation of thin gold foils. R. SMOLUCHOWSKI (Physical Rev., 1936, [ii], 49, 649).—Measurements on a series of foils, made by condensing Au vapour on glass plates, and varying from "colloidal" foils to well-developed crystal layers, show that the different structures of the foils appear in the shape of the light-absorption curve. The dependence of the observed max. and min. of absorption in the region 4800—6800 Å. on foil thickness and the angle of transmission of the light beam indicates that the origin of these consecutive max. and min. lies in the grain structure of the foils and not in the electronic levels in the metal lattice.

L. S. T.

Reflexion and absorption of light by partially transparent films of silver and aluminium. A. BAXTER (J. Sci. Instr., 1937, 14, 303—306).—Reflexion and absorption coeffs. are measured at normal incidence for films prepared by evaporation in vac. Al is stable and nearly grey at all densities, but Ag films show marked colour selectivity varying with density and age. From the results the two metals

may be compared at any specified density and colour of light. For half-silvering Al always gives the higher reflexion coeff. Reflexion coeffs. of opaque films are given: Al 91 to 93% from blue to red, and Ag 79 to 94% from blue to red. N. M. B.

Effect of occluded hydrogen on the rigidity of metals. J. LYNCH (Nature, 1937, 140, 363).—The rigidity of Pd decreases (up to 23%) when H_2 is occluded. L. S. T.

Effect of reversed deformation on recrystallisation. P. A. BECK (Amer. Inst. Min. Met. Eng., Tech. Publ. 818, 1937, 14 pp.; Met. Tech., 1937, 4, No. 4).—Al single crystals were recrystallised after being bent and straightened. The consumptibility (tendency of the deformed crystals to be consumed by the recrystallisation of new crystals) was decreased for all crystal orientations and deformation vals. were examined. There appears to be no direct physical relation between hardening and recrystallisation. R. B. C.

Coercive force in single crystals. K. J. SIXTUS (Physical Rev., 1937, [ii], 52, 347—352).—The coercive force of 10 single-crystal discs of Si-Fe was measured in different directions in their planes, and its variation with direction and relation to field direction and crystal axes are discussed. The effect of varying the disc shape and of increasing the internal strains was investigated. N. M. B.

Energy and lattice spacing in strained solids. G. R. STIBITZ (Physical Rev., 1936, [ii], 49, 862—863).—A relationship between the distortion of the lattice and the potential energy of internal strain in cold-worked crystals is deduced. L. S. T.

Variation of rigidity and of the decrement of torsional vibrations with magnetisation in iron. W. F. BROWN (Physical Rev., 1936, [ii], 49, 863).—From demagnetisation to saturation, the rigidity of annealed material increases approx. 0.26% and Young's modulus approx. 0.30%. Both changes are approx. 50% > before annealing. The decrement of torsional vibrations before annealing varies with magnetisation in a manner similar to that described (*ibid.*, 1934, 45, 742) for longitudinal vibrations. L. S. T.

Energy of lattice distortion in hard-worked permalloy. F. E. HAWORTH (Physical Rev., 1936, [ii], 49, 863).—The lattice distortion produced by severe cold-working of permalloy (70% Ni) has been investigated by measuring the broadening of the reflexion of the $K\alpha$ doublet by the (311) planes. Broadening decreases on annealing, and recovery is complete at 650°. The energy of distortion in the hard-worked condition is 23×10^6 ergs per $cm.^3$ or 0.068 g.-cal. per g. L. S. T.

Transition of amorphous to crystalline carbon. M. ÇELEBI (Z. Physik, 1937, 106, 702—708).—Amorphous C prepared from sugar has $\rho = 10^{11}$ ohms per c.c., allowing ϵ (= about 3.9) to be measured in the usual way. κ - T measurements show that transition occurs in the region 600—700°. L. G. G.

State of dislocation of deformed metallic crystals. G. A. HOMES, M. BRUNIN, and P. DUWEZ (Bull. Acad. roy. Belg., 1937, [v], 23, 653—658).—

Deformed metallic crystals are in a state of pre-dissociation, in which the form and individuality are retained whilst the lattices are broken into net blocks which depart more or less from the original orientation. The degree of departure depends on the deforming force, and determines the behaviour of the metal in subsequent recrystallisation. F. J. L.

Evidence for molecular shift in the solid state. J. E. RICCI (J. Amer. Chem. Soc., 1937, 59, 1764—1765).—The evidence quoted by Hahn ("Applied Radiochemistry," New York, 1936) in support of chemical interaction in the solid state is criticised. E. S. H.

Macroscopic theory of metallic conduction. E. WEBER (Physical Rev., 1936, [ii], 49, 879).—Electric conduction is regarded as analogous to the flow of a viscous compressible fluid in a tube. The theory gives expressions for the resistance change in a magnetic field in agreement with experiment. L. S. T.

Crystal structure and electric properties. VII. Anisotropy of electrical conductivity in bismuth crystals. O. STIERSTADT (Z. Physik, 1937, 107, 51—63; cf. A., 1935, 567, 1062).—A continuation of earlier work. Each plane in, or straight line through, the crystal lattice possesses sp. anisotropy. L. G. G.

Diamagnetism of mercury. S. S. BHATNAGAR and M. B. NEVGI (Current Sci., 1937, 6, 53—54).—The val. $\chi = -0.172 \times 10^{-6}$ has been obtained for liquid Hg obtained from pure HgO , $Hg(NO_3)_2$, and $Hg(OBz)_2$. This val. is < that for Hg vapour, probably owing to the existence of polyat. mols. in the liquid state. The at. susceptibility (-34.5×10^{-6}) is approx. = the val. for covalent Hg^{II} . A. J. E. W.

Diamagnetic susceptibility of some complex ions. S. R. RAO and S. SRIRAMAN (Current Sci., 1937, 6, 54—55; cf. this vol., 20).—Vals. of χ for six ions in solid salts and in aq. solution have been compared in order to examine the effect of ionic deformations. CO_2H' and OAc' show a very small increase in solution; a larger increase is observed with NO_2' , NO_3' , and SeO_3'' , and a decrease with IO_3' . The results for SeO_3'' confirm that Se is sexavalent in solid H_2SeO_3 , becoming quadrivalent in aq. solution. A. J. E. W.

Paramagnetism of complex chromium salts. L. LEITERER (Z. physikal. Chem., 1937, B, 36, 325—338).—The susceptibilities of $[Cr, 6NH_3]Br_3$, $[Cr, 6NH_3]I_3$, $[Cr, en_3]I_3 \cdot H_2O$, $[Cr, 5NH_3, CNS]Cl_2$, $[Cr, 6CO(NH_2)_2]Cl_3$, and $[Cr, 3C_5H_5N, Cl_3]$ have been measured at 90° and 300° K. The deviations from Curie's law are small ($\theta \pm 7^\circ$). A graph of θ against the λ of the optical absorption centre is a hyperbola, θ increasing as the absorption shifts towards shorter $\lambda\lambda$ (cf. A., 1933, 336). R. C.

Domain theory of ferromagnetics under stress. I. W. F. BROWN, jun. (Physical Rev., 1937, [ii], 52, 325—334).—Mathematical. The statistical domain theory is developed in a form applicable to any cryst. or polycryst. ferromagnetic. Formulae are derived for the magnetisation and strain components and are then specialised to Ni crystals.

Results agree with or correct those of other investigators. N. M. B.

Effect of absorbed hydrogen on the magnetic susceptibility of manganese. M. A. WHEELER (Physical Rev., 1936, [ii], 49, 642–643).—Changes in susceptibility obtained when H_2 is absorbed by Mn at temp. at which the α -, β -, and γ -forms, respectively, are stable are recorded and discussed. L. S. T.

Magnetic susceptibility of oxides of lead. L. WELO and M. PETERSEN (Physical Rev., 1936, [ii], 49, 864).—Measurements of the magnetic susceptibility of the product of vac. decomp. of PbC_2O_4 at 200–300° fail to confirm the view (A., 1932, 132) that reduction of Pb oxide by $NHPh \cdot NH_2$ produces some Pb suboxide. No evidence for the existence of a stable Pb suboxide was obtained. L. S. T.

Temperature variation of the magnetic anisotropy of ammonium nitrate. P. NILAKANTAN (Physical Rev., 1937, [ii], 52, 383–384).—Measurements of anisotropy plotted as a function of temp. confirm the results of X-ray analysis on the temp. variation of crystal structure and the orientation of the ions. Measurements on cooling indicated the existence of a transition lag. N. M. B.

Recent advances in theoretical organic chemistry; behaviour of organic substances in the electric and magnetic field. E. MÜLLER (Naturwiss., 1937, 25, 545–556).—The theoretical bases of the behaviour of org. substances in an electric or magnetic field and the experimental determination of magnetic susceptibility are discussed. The behaviour of diamagnetic compounds is considered. More extended treatment is given to paramagnetic substances with particular reference to diradicals, metallic ketyls, and vitamin- B_2 (cf. A., 1936, 712, 1370, 1381, 1391, 1396). H. W.

Diffraction of light by ultrasonic waves. S. M. RITOV (Bull. Acad. Sci. U.R.S.S., 1937, Ser. Phys., 223–259).—Theoretical. J. S. A.

Circular ultra-sonic grating in liquids. (Miss) J. ČEROVSKÁ (Nature, 1937, 140, 425). L. S. T.

Dispersion of sound velocity in liquids. S. PARTHASARATHY (Current Sci., 1937, 6, 55–56; cf. A., 1936, 1189).—The velocity of sound is greater at 14.5 than at 3.5 mc. in C_6H_6 , CCl_4 , and tetrahydronaphthalene. In $C_5H_{11} \cdot OAc$ it is lower at 14.5 mc. PhMe and *m*-xylene give no dispersion. A. J. E. W.

Normal b.p. and critical constants of *n*-heptane. J. A. BEATTIE and W. C. KAY (J. Amer. Chem. Soc., 1937, 59, 1586–1587).— C_7H_{16} has b.p. $98.52 \pm 0.01^\circ$ K. The crit. consts. are T_c $267.01 \pm 0.2^\circ$ K., p_c 27.00 ± 0.02 atm., v_c 0.416 litre per mol., d_c 2.40 mol. per litre. E. S. H.

Specific heat of sodium carbonate by twin calorimeter. M. MATSUI and S. KITAZATO (J. Soc. Chem. Ind. Japan, 1937, 40, 246–248B).—Using a twin calorimeter, the sp. heat of Na_2CO_3 has been found to be $0.2701_4 \pm 0.13\%$ at 25° . R. S. B.

Determination of specific heat of powdered aluminium hydroxide and sodium oxalate. S. I. TSCHERBOV and E. L. TSCHERNIAK (J. Appl. Chem.

Russ., 1937, 10, 1220–1222).—The sp. heat of Al_2O_3 rises from 0.1836 at 20° to 0.2182 at 100° ; that of $Na_2C_2O_4$ is 0.2521 at 0– 100° . R. T.

Heat capacities and entropies of organic compounds. III. Methylamine from 11.5° abs. to the b.p. Heat of vaporisation and vapour pressure. Entropy from molecular data. J. G. ASTON, C. W. SILLER, and G. H. MESSERLY (J. Amer. Chem. Soc., 1937, 59, 1743–1751; cf. A., 1936, 937).—Heat capacity data are recorded; in the range 95– 175° K. solid NH_2Me exhibits hysteresis effects. NH_2Me has m.p. -93.46° , b.p. -6.32° , heat of fusion 1465.8 and heat of vaporisation 6169 g.-cal. per mol., v.p. at 190° K. to the b.p. $\log_{10} P_{mm.} = -(2089.100/T) - 6.05920 \log_{10} T + 2.61668 \times 10^{-4} - 5.47880 \times 10^{-7}T^2 + 25.44187$. The calc. "spectroscopic" entropy is 58.06 e.u. per mol. at 1 atm. and 266.84° K. The mol. entropy of the ideal gas at the b.p. is 56.42 ± 0.3 e.u. The mol. entropies of the superheated liquid and ideal gas at 298.16° K. and 1 atm. are 35.9° and 57.73 e.u., respectively. E. S. H.

Approximate evaluation of the free energy of phenol and cresol. D. ANDREEVSKI (Prom. Org. Chim., 1937, 3, 564–565).—The free energy ΔF of PhOH vapour is given by $-15,130 + 24.95T \times \log T - 0.0194T^2 - 106.62T$, and of *m*-cresol by $-27,346 + 31.25T \log T - 0.02295T^2 - 123.62T$. R. T.

Thermodynamics of gaseous hydrocarbons. K. S. PITZER (J. Chem. Physics, 1937, 5, 752).—Errata (cf. this vol., 398). W. R. A.

Vapour pressures of some hydrocarbons and ketones. L. MAESS and L. VON MÜFFLING (Angew. Chem., 1937, 50, 759–761).—V.p. and n_D data are recorded for 11 hydrocarbons and 3 ketones, and compared with lit. vals. The mol. heats of vaporisation and the Trouton quotients (k) are deduced. The mean val. of k is 22.3 and its use permits approx. calculation of the v.p. of hydrocarbons and ketones from the b.p. when the latter is between 60° and 120° . J. W. S.

Limit of superheating and resistance to tensile stress of liquids. W. DÖRING (Z. physikal. Chem., 1937, B, 36, 371–386).—By the method previously described (A., 1936, 156) the frequency of formation of vapour nuclei in a superheated liquid has been calc. The results show that there is a well-defined temp. limit above which a liquid cannot be superheated and the calc. val. of this limit agrees with existing experimental data. The max. tensile stress to which a liquid may be subjected has also been calc.; the theoretical val. has as yet not been approached experimentally. R. C.

Changes in the density of silver with annealing and cold-working. A. IGATA (Mem. Coll. Sci. Kyoto, 1936, 19, A, 215–222).—The d of cold-rolled Ag is max. when annealed at 200– 300° and min. when annealed at 600– 800° . The variation is due to minute cavities formed between 400° and 600° and destroyed at 600– 900° . The standard d is obtained after successive annealings until there are

very few remaining cavities, followed by cold-rolling, and a final annealing at 250°. $d^{17} = 10.502$.

F. J. L.

Anomalous relation between the specific volume of liquid water and temperature. U. YOSHIDA (Mem. Coll. Sci. Kyoto, 1936, 19, A, 271—277).—The anomalous sp. vol., sp. heat, and viscosity of liquid H_2O are partly explained by assuming the existence of tiny ice crystals with vol. of order of one unit cell.

F. J. L.

Octanes. A. MAMAN (Compt. rend., 1937, 205, 319—321).— d , n , crit. solution temp., and a measure of the resistance to oxidation are given for a no. of isomerides.

F. J. G.

Interaction of vapour molecules with a crystal surface. T. ALTY (Proc. Roy. Soc., 1937, A, 161, 68—79).—By measurement of the rates of sublimation of crystals of I, $C_{10}H_8$, synthetic camphor, and $BzOH$ the coeffs. of condensation for the vapour mol. are deduced.

G. D. P.

Second virial coefficient of argon. K. F. HERZFELD (Physical Rev., 1937, [ii], 52, 374).—The coeff. is calc. from the energy expression for frozen A (cf. A., 1935, 157).

N. M. B.

Cluster theory of imperfect gases. C. F. GOOD-EVE (Nature, 1937, 140, 424—425).—Attention is directed to the possibilities in this theory of explaining the behaviour and properties of gases.

L. S. T.

Range of validity of Nernst's heat theorem. O. REDLICH (Z. Physik, 1937, 106, 539).—A reply to Schmolke's criticisms (this vol., 71).

H. C. G.

Compressibilities of liquid and gaseous normal heptane and an equation of state for gaseous normal heptane. L. B. SMITH, J. A. BEATTIE, and W. C. KAY (J. Amer. Chem. Soc., 1937, 59, 1587—1589).—Compressibilities of liquid C_7H_{16} have been determined for the ranges 30—250° and 7—350 atm., and of gaseous C_7H_{16} for the ranges 275—350° and 1.0—5.0 mols. per litre. The consts. of the Beattie-Bridgeman equation of state have been determined from the data for $d < \text{the crit.}$

E. S. H.

Compressibility of and an equation of state for gaseous propane. J. A. BEATTIE, W. C. KAY, and J. KAMINSKY (J. Amer. Chem. Soc., 1937, 59, 1589—1590).—Compressibility data are recorded for the ranges 96.81—275° and 1.0—10.0 mol. per litre. The consts. of the Beattie-Bridgeman equation have been determined from data below the crit. d .

E. S. H.

The viscosity-temperature function. E. L. LEDERER (Petroleum, 1937, 33, No. 36; Motorenbezt., 2—7).—The mathematics of the η -temp. function are discussed. The second differential η'' is given by $\log \eta'' = a/T - b$, where a has the dimensions of energy, b represents entropy, and T is the abs. temp. This relation represents the facts within the limits of experimental error. As the above cannot be integrated to a finite form, if it is strictly accurate and not merely an approximation, it follows that a finite definition of the η -temp. relation is not possible but that all relations are merely approximations. a is simply related to mol. wt. and its measurement throws

light on the constitution of certain classes of compounds. The bearing of this on Ubbelohde's η -“polhöhe” is discussed.

H. C. R.

Theory of the viscosity of liquids as a function of temperature and pressure. R. H. EWELL and H. EYRING (J. Chem. Physics, 1937, 5, 726—736).—An equation for the η of a liquid in terms of the energy of vaporisation (E) and the molal vol. is developed from Eyring's reaction rate theory of η . It is assumed that there is a translational degree of freedom corresponding with flow and that the energy of activation for the elementary flow is $(E)/n$. Spherical mols. have $n = 3$, whilst for non-spherical mols. $n > 3$ and usually = 4. For liquid metals elementary flow is much smaller and of the order of 0.1 to 0.4 of the corresponding (E). Data for η of S confirm the S_8 ring structure at 160° and suggest that at $>250^\circ$ the mol. consists of long chains containing approx. 36 atoms. Data for long-chain paraffins, water, and other associated mols. are discussed. For increased pressures E must be replaced in the derived equation by $V(p_{int} + p_{ext})$ to give another equation from which either the internal pressure or the η of a liquid under pressure can be computed provided that either is known. Utilising Bridgman's η data, vals. of the internal pressure for some liquids are calc. and agree with internal pressures derived from compressibility data.

W. R. A.

Thermal diffusion of radon gas mixtures. G. E. HARRISON (Proc. Roy. Soc., 1937, A, 161, 80—94).—The diffusion of H_2 -Rn and He-Rn mixtures has been studied by a differential γ -ray method, and the repulsive force index, S_{12} , is evaluated. For H_2 -Rn it is 6.3 and for He-Rn 7.3. Comparison with previous work shows that the Rn mol. must be very “soft.”

G. D. P.

Physico-chemical study of intermetallic molecular solid solutions. N. V. AGEV (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 285—319).—Types of solid solutions are discussed in relation to their space-lattice arrangement.

R. T.

Constitution of high-purity iron-carbon alloys. R. F. MEHL and C. WELLS (Amer. Inst. Min. Met. Eng., Tech. Publ. 798, 1937, 41 pp.; Met. Tech., 1937, 4, No. 4).—A series of Fe-C alloys containing 0—1.4% of C was prepared from Fe carburised in dipentene + H_2 and dipentene + C_6H_6 + H_2 . The technique of preparing homogeneous alloys of any desired C content is described. The transformation temp. Ar_3 , Ac_3 , Ar_1 , Ac_1 , Ac_{cm} and Ar_{cm} of the alloys were determined by dilatometric, thermal, magnetic, and microscopical methods. Information was also obtained relative to the degrees of superheating and undercooling in the metastable Fe-Fe₃C system.

R. B. C.

Equilibrium diagram of the system magnesium-lithium. F. I. SCHAMRAI and P. J. SALDAU (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 349—362).—Mg-Li alloys containing <5% Li are less corrodible than pure Mg, whilst alloys containing <15% Li are found to possess satisfactory mechanical properties. The solid solubility of Li in Mg (α -phase) rises from 10 at.-% at 15° to 12.5 at 465°, 19 at 500°,

and 21% at 588° (eutectic). The β -phase (29—95 at.-% Li) consists of solid solutions of $LiMg_2$, m.p. 600°; the compound Li_2Mg_5 is not confirmed. The γ -phase (98—100% Li) is a solid solution of Mg in Li. R. T.

Equilibrium relations in the nickel-tin system. W. MIKULAS, L. THOMASSEN, and C. UPTEGROVE (Amer. Inst. Min. Met. Eng., Tech. Publ. 814, 1937, 23 pp.; Met. Tech., 1937, 4, No. 5).—The equilibrium diagram has been obtained by thermal and metallographic methods, and the solubility of Sn in Ni determined by means of X-rays. Conditions for the formation of Ni_3Sn_4 , Ni_3Sn , Ni_4Sn , and Ni_5Sn_2 are indicated. The solid solubility of Sn in Ni is 18.4% at 1100° and 1.6% at 450°. R. B. C.

Precipitation-hardening of nickel-beryllium alloys. W. GERLACH (Z. Metallk., 1937, 29, 124—131).—Determinations of the magnetic transformation points of Be-Ni alloys quenched from 1000—1200° and annealed to equilibrium at various temp. show that the solubility of Be in Ni increases linearly from 1.5 at.-% at 400° to a max. of 16 at.-% at 1150°; addition of Mn to Be-Ni alloys results in the pptn. of Mn_2Be , which appears to be insol. in solid Ni. Magnetic determinations made during the ageing of quenched Be-Ni alloys indicate that pptn. occurs simultaneously in a heterogeneous manner, proceeding inwards from the grain boundaries, and in a homogeneous manner, proceeding uniformly throughout the grains. Pptn. becomes more homogeneous at const. ageing temp. with increasing degree of supersaturation, and at const. degree of supersaturation with increasing ageing temp. The heat of activation of homogeneous pptn. is 54 kg.-cal. per mol. Max. coercivity is shown by the stable α -phase produced at the beginning of heterogeneous pptn. A. R. P.

Structure of eutectic alloys; changes produced by rolling and heating. G. TAMMANN and H. HARTMANN (Z. Metallk., 1937, 29, 141—144).—During the solidification of many eutectic alloys, e.g., Zn-Sn, Cd-Sn, and PbSn, the polyhedral crystals of eutectic grow from crystallisation nuclei in such a way that one constituent forms a spherulitic bundle of fibres radiating outwards from the nucleus. Eutectics containing a brittle constituent, e.g., Cu-Cu₂O, Si-Ag, and Sb-Pb, do not show this spherulitic fibrous structure and, unlike those which do, cannot be rolled very far before edge-cracking occurs. On rolling the spherulitic eutectics the fibres bend over in the direction of rolling and eventually become undulating through the sheet produced; subsequent annealing produces a shrinking up of these fibres. Since the rate of crystallisation of a eutectic is < that of its constituents and is the smaller the greater is the no. of these, it should be possible to cool a quaternary eutectic so rapidly that it solidifies in a glassy amorphous state; this has been confirmed by quenching Wood's metal in liquid air. A. R. P.

General laws of phase transformations in eutectoidal alloys. G. KURDJUMOV (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 271—284).—Transformations of supercooled solid solutions involve

two types of reaction: diffusion and crystallisation processes with velocities which \propto temp., and abrupt space-lattice transformations. R. T.

Theory of construction of diagrams of state of alloys. S. T. KONOBEVSKI (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 255—270).—Theoretical. R. T.

Röntgenographic and electric investigations of copper-platinum systems. J. O. LINDE (Ann. Physik, 1937, [v], 30, 151—164).—Sp. electrical resistance and lattice dimensions of the Cu-Pt system after three different types of heat-treatments have been exhaustively studied for systems containing approx. 50 at.-% Pt. W. R. A.

Magnetic properties of iron amalgams. L. F. BATES and P. F. ILLSLEY (Proc. Physical Soc., 1937, 49, 611—618).—The magnetic properties of frozen amalgams prepared by electrolysis have been investigated at -78.5° by the Gouy method. Minute traces of Fe induce ferromagnetic properties. The Fe behaves as if its sp. magnetisation were 130 c.g.s. units as compared with 220 for pure Fe. The increasing paramagnetism of the amalgam with rise of Fe content suggests the presence of a compound. N. M. B.

Magnetic properties of alloys of iron with iridium. M. FALLOT (Compt. rend., 1937, 205, 517—518; cf. this vol., 509).—The Curie points, α - γ transformation temp., and mean at. moments of alloys with 0—15 at.-% Ir have been determined. A. J. E. W.

Superlattices. C. S. BARRETT (Met. and Alloys, 1937, 8, 251—256, 260).—A summary.

The superlattice in β -brass. F. W. JONES and C. SYKES (Proc. Roy. Soc., 1937, A, 161, 440—446).—By the use of Zn K radiation, X-ray photographs of β -brass showing superlattice lines have been obtained. It is inferred that β -brass has an ordered at. distribution at room temp. G. D. P.

Resistance of alloys with disordered and ordered arrangement of atoms. G. BORELIUS (Proc. Physical Soc., 1937, 49, Extra Part, 77—95).—A survey of the interpretation of resistance-concn. curves in relation to the crystal structure of Au-Ag, Au-Cu, and Au-Pt alloys, the transformation from disordered to ordered at. arrangements in relation to concn., heat-treatment, and cold-working, the measurement of degree of disorder, and hysteresis effects. N. M. B.

Order-disorder transformation. W. L. BRAGG, C. SYKES, and A. J. BRADLEY (Proc. Physical Soc., 1937, 49, Extra Part, 96—102).—A summary of work on order-disorder transformations in alloys, with reference to the nature of the dependence of order on temp., energy changes associated with the formation of the superlattice, the time of relaxation, and the influence of order on magnetic properties. N. M. B.

An extension of Bethe's theory of order-disorder transitions in metallic alloys. T. S. CHANG (Proc. Roy. Soc., 1937, A, 161, 546—563).—Energy terms are introduced into the theory to represent interactions between nearest neighbours

and also next nearest neighbours in the cubic and body-centred cubic lattices. The resulting sp. heat-temp. relation gives better agreement with experimental vals. than that obtained with the simpler assumptions. The effect of neglecting higher interaction terms does not alter the essential features of the theory. G. D. P.

Heat of formation of some alloys. W. SEITH and O. KUBASCHEWSKI (Z. Elektrochem., 1937, 43, 743—749).—The phase diagrams and heats of formation at room temp. of the systems Pb-Mg, Pb-Li, W-Mg, W-Na, W-Li, and Cd-Na have been determined, together with the heats of formation in the systems Pb-Mg and W-Mg at 860°. The existence of the compounds Mg_2Pb , Na_4Pb , Na_5Pb_2 , Na_2Pb , $NaPb$, Li_4Pb , Li_5Pb_2 , Li_3Pb , Li_5Pb_2 , $LiPb$, Mg_3Bi_2 , Na_3Bi , $NaBi$, $LiBi$, Li_3Bi , $NaCd_2$, $NaCd_6$, Mg_2Pb , and Mg_3Bi_2 is indicated. J. W. S.

Critical temperature of water and of aqueous solutions of sodium silicate. N. I. CHITAROV and L. A. IVANOV (Zentr. Min., 1936, A, 46—54; Chem. Zentr., 1936, i, 3655—3656).—Vals. found are: for H_2O 374°, for 0.5N- Na_2SiO_3 , 391.9°; N- Na_2SiO_3 400.8°; 1.2N- Na_2SiO_3 , 402.1°. Gaseous solutions of Na_2SiO_3 containing up to 18 kg. of Na_2SiO_3 per cu.m. may be obtained in the super-crit. region. J. S. A.

Density-pressure-temperature relations of the hydrogen chloride-propylene system in the critical temperature pressure region. Reaction velocity near the critical temperature. C. H. HOLDER and O. MAASS (Canad. J. Res., 1937, 15, B, 345—351).—Measurements of \bar{d} have been made for 2:1 and 1:1 mixtures of HCl and C_3H_6 at 78—115° and 27—115 atm. The 2:1 mixture at 105° and 100 atm., which is above the crit. region, showed only 2.5% reaction in 5 hr., whereas on cooling to 50° 3% reaction occurred in 0.5 hr. R. S. B.

System benzylcellulose-benzene-ethyl alcohol. II. W. L. H. MOLL and G. W. FULLER (Kolloid-Z., 1937, 80, 320—326; cf. this vol., 356).—Data relating to η , structure viscosity, and solubility in the ternary system, and for the heat of mixture and conductivity of C_6H_5 -EtOH are recorded. In 90:10 C_6H_5 -EtOH there is a min. in η and a max. in solubility and surface tension; in the 70:30 mixture the polarisation of EtOH, the \bar{d} and coagulation val. of the solution have max. vals. The results are discussed in relation to dielectric properties. E. S. H.

Solubility of silica dusts. E. J. KING (Nature, 1937, 140, 320).—The amounts of SiO_2 dissolved by 1% $NaHCO_3$ from quartz and sericite (I) at 37° and 100°, over different periods of time, and by "ascitic fluid" from pptd. SiO_2 , quartz, kaolin, and mica at 37° are recorded. The high results of Emmons and Wilcox (this vol., 484) for (I) in blood-serum are regarded as erroneous, in that the method of centrifuging did not completely remove finely-divided particles from suspension. L. S. T.

Solubility of sodium silicofluoride in aqueous phosphoric acid, and its salting out by sodium chloride. M. TSCHEPLEVETSKI and C. BOLTZ (J. Appl. Chem. Russ., 1937, 10, 1183—1193).—The

solubility of Na_2SiF_6 rises rapidly with increasing temp., and falls with increasing $[NaCl]$ and $[H_3PO_4]$. Pptn. is incomplete in presence of Al_2O_3 , owing to formation of cryolite. R. T.

Demonstration of a negative temperature coefficient of solubility. L. A. BATEMAN and W. C. FERNELIUS (J. Chem. Educ., 1937, 14, 315).—A solution of $Ce_2(SO_4)_3$, saturated at room temp., is heated to 100° in a sealed tube. L. S. T.

Theoretical formula for the solubility of hydrogen in palladium. J. R. LACHER (Proc. Roy. Soc., 1937, A, 161, 525—545).—The theory assumes that H atoms occupy holes in the Pd lattice and leads to a formula indicating the existence of a crit. temp. above which only one solid phase can exist, but below which two phases coexist in equilibrium. Heats of absorption are calc. and pressure-composition isotherms are shown to accord with the experimental facts, and to explain "hysteresis" phenomena exhibited by this system. Hydrides are not formed. The solubility of D_2 is discussed. G. D. P.

Diffusion of hydrogen through nickel and iron. W. R. HAM (Trans. Amer. Soc. Met., 1937, 25, 536—570).—The rate of diffusion (D) agrees with the general equation derived from the kinetic theory on the assumption that it is chemical in nature. A linear relation exists between $\log D$ and $\log P$ (gas pressure) at const. temp. The isotherms for the pure metals have a slope of 0.5. When the metals are not degassed or contain, e.g., C or N in solution, the slope is >0.5 , the increase in slope being approx. \propto amount of impurities present. A linear relation exists between D and $1/T$ if no phase change (crystal structure) or electronic change (e.g., magnetic) occurs. The magnetic change at about 360° and 750° in Ni and Fe, respectively, is clearly indicated by diffusion data. R. B. C.

Effect of pressure and temperature on the occlusion of hydrogen by palladium. E. A. OWEN and J. I. JONES (Proc. Physical Soc., 1937, 49, 587—602).—Using the X-ray method, measurements of the parameter of Pd at 80°, 100°, 120°, 140°, and 160° in an atm. of H_2 at pressures 0—76 cm. Hg have been made. At const. temp. there is a linear relation between the lattice parameter and the pressure for each of the two phases in the system. For dil. solutions of H_2 in Pd the change in parameter varies directly as the pressure and inversely as the square of the temp. The entry of H atoms into the Pd lattice loosens the bonds between the Pd atoms, allowing these to separate more readily under the action of heat. The parameter of pure Pd is 3.8825 ± 0.0003 Å. at 20°, and the mean coeff. of thermal expansion in the range 0—300° is 12.7×10^{-6} per degree. N. M. B.

Palladium-hydrogen system. E. A. OWEN and J. I. JONES (Proc. Physical Soc., 1937, 49, 603—610).—The hysteresis observed when the pressure of the gas is taken through a cycle of changes at const. temp. has been examined by the X-ray method. Measurements of the parameter at different pressures, and the appearance and disappearances of the α - and β -phases indicate that the system consists of two

solid solutions at 100° and 120°. The H-rich phase is said to afford evidence of the compound Pd_2H which can dissolve H, whilst the β -phase lattice is always distorted until a temp. well above that necessary to remove H from the Pd is reached. It is suggested that the gas is not in its normal state when it leaves the metal.

N. M. B.

Absorption of hydrogen by rhodium. I. E. ADADUROV and N. I. PEVNI (J. Appl. Chem. Russ., 1937, 10, 1216—1219).—Rh does not absorb H_2 at 20—450°/80—323 mm; conflicting results are ascribed to the use of impure Rh. The present observations justify the use of Pt-Rh alloys as catalysts in the oxidation of NH_3 .

R. T.

Partial pressures of hydrogen chloride from benzene solutions at 30°. J. H. SAYLOR (J. Amer. Chem. Soc., 1937, 59, 1712—1714).—Direct determinations indicate that HCl is a normal solute in dry C_6H_6 and in C_6H_6 saturated with H_2O .

E. S. H.

Sorption of heavy water vapour by active charcoal. K. ARII (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 749—756).—The sorption of D_2O has been studied statically at 20°, 30°, and 50° with sugar charcoal activated at 800°.

R. S. B.

Analysis by adsorption of the surface structure of graphite. R. M. BARRER (Proc. Roy. Soc., 1937, A, 161, 476—493).—The sorption isotherms, from 80° to 273° K., have been determined for H_2 , N_2 , and A on Acheson graphite, and heats of sorption are deduced from the data by use of the Clapeyron equation. In each case the heat of sorption is a function of the quantity adsorbed, decreasing rapidly and tending to a limiting val. as the quantity adsorbed increases. The initial val. is regarded as arising from sorption in cracks and the final val. as due to sorption on plane surfaces. Deviations from the Langmuir isotherm are discussed and an alternative expression is derived which gives good agreement with the observations.

G. D. P.

Heats of adsorption at -183°: hydrogen on chromic oxide. R. A. BEEBE and H. M. ORFIELD (J. Amer. Chem. Soc., 1937, 59, 1627—1629).—A modified calorimeter is described (cf. this vol., 25). The differential heats of adsorption are initially about 5 kg.-cal. per mol., decreasing to about 3 kg.-cal. per mol. in the later stages of adsorption. The part of the surface for which the heat of adsorption is 3—4 kg.-cal. per mol. is probably the seat of catalytic activity in the reaction between H_2 and D_2 .

E. S. H.

Adsorption of oxygen and sulphur dioxide on chromic oxide, after and before poisoning by arsenic. I. E. ADADUROV and N. I. PEVNI (Ukrain. Chem. J., 1937, 12, 317—334).—Adsorption of O_2 by Cr_2O_3 rises, whilst that of SO_2 falls, with rising temp. The catalyst becomes lighter in colour after adsorption of SO_2 , and darker after adsorption of O_2 , pointing to formation of lower and higher oxides, respectively; the process thus involves chemisorption. Sorption of SO_2 is diminished, and that of O_2 increased, by As_2O_3 , which is itself oxidised to As_2O_5 .

R. T.

Adsorption of hydrogen on silica gel and glass. L. G. MAIDANOVSKAJA (J. Phys. Chem. Russ., 1935, 6, 1111—1116).—Van der Waals adsorption is found to occur at -183° to 200°, and activated adsorption at 200—500° in the case of both platinised and unplatinised SiO_2 gel. Platinised and unplatinised Pyrex glass gave activated adsorption at 200—500°. The activated adsorption is approx. unimol.

CH. ABS. (e)

Relation of sorption of gases to their molecular structure. K. PETERS and W. LOHMAR (Z. physikal. Chem., 1937, 180, 58—78).—For the adsorption of noble gases and CH_4 on activated C the graph of $\log a$ against $\log p$ (a = amount adsorbed, p = equilibrium pressure) is linear and the adsorption is reversible. The mass of the mol. has a much smaller influence on a than has the mol. structure. For C_2H_6 , C_3H_8 , n - and iso - C_4H_{10} the rate of increase of $\log a$ with $\log p$ falls with increasing p and for a given a the corresponding p on the desorption isotherm is < on the adsorption isotherm. It is inferred that in the adsorption of complex mols. the adsorbed mols. exist in several modifications which differ, e.g., in their orientation on the surface, and that each modification has its own adsorption isotherm, similar to a noble gas. The proportions of the various modifications probably vary with p . The more nearly spherical are the adsorbed mols., the smaller will be the difference between the modifications. In adsorption, p is determined by the mols. held most loosely and in desorption by the mols. held most firmly.

R. C.

Corresponding states of gas adsorption. K. PETERS (Z. physikal. Chem., 1937, 180, 79—91).—Existing data for the adsorption of noble gases indicate that in the isotherm $a = \alpha p^{1/n}$ both $\log \alpha$ and $1/n$ are linear functions of the reduced temp. By means of this relation a "reduced" adsorption isotherm has been derived, which contains no individual consts. characteristic of the adsorbate.

R. C.

Chemisorption on charcoal. IX. Influence of temperature of activation on sorption of acids and bases. A. KING (J.C.S., 1937, 1489—1491; cf. this vol., 76).—Using HCl, AcOH, BzOH, NaOH, and aq. NH_3 as adsorbates on sugar C (ash 0.02%) activated at different temp. (t), max. base and min. acid adsorption are found for $t = \sim 400^\circ$, and max. acid and zero base adsorption for $t = \sim 850^\circ$. Above 850° base adsorption reappears to a slight extent. The results are ascribed to the formation of sp. surface oxides.

F. L. U.

Kinetics of adsorption with interaction between the adsorbed particles. J. K. ROBERTS (Proc. Roy. Soc., 1937, A, 161, 141—153).—Expressions are obtained for the rates of evaporation and condensation when adsorption takes place with and without dissociation. Evidence showing that the adsorbed film of H_2 on W is immobile at room temp. is discussed. The rates of formation of mobile and immobile films are considered numerically. Earlier considerations relating to the mechanism of production of at. H at a hot W surface are not affected

when the effects of interaction between adsorbed particles are included. G. D. P.

Conditioning surfaces for adsorption. I. LANGMUIR and V. J. SCHAEFER (J. Amer. Chem. Soc., 1937, 59, 1762—1763).—Improved technique is described (cf. this vol. 479). E. S. H.

Adsorption of alkali on charcoal. R. BURSTEIN (Acta Physicochim. U.R.S.S., 1937, 6, 371—374).—As a result of more accurate measurements a previous statement (cf. A., 1933, 898) that C freed from gas at 950° does not adsorb Na⁺ from 0.01N-NaOH, but that C which has adsorbed H₂ at 300—800° adsorbs alkali equiv. to the adsorbed H₂, is not confirmed. It is now shown that the amount of adsorbed alkali is < the equiv. of the adsorbed H₂. C. R. H.

Exchange adsorption phenomena with calcium oxalate monohydrate. I. M. KOLTHOFF and E. B. SANDELL (J. Amer. Chem. Soc., 1937, 59, 1643—1648).—At the surface of CaC₂O₄·H₂O exchange of SO₄²⁻, IO₃⁻, or OH⁻ with C₂O₄²⁻ and of Ba²⁺, Mn²⁺, and probably Mg²⁺ with Ca²⁺ occurs, but exchange of Na⁺, NH₄⁺, or H⁺ with Ca²⁺ or of Cl⁻ with C₂O₄²⁻ has not been observed. A saturated solution of CaC₂O₄ in an electrolyte does not contain equiv. amounts of Ca²⁺ and C₂O₄²⁻ when one of the lattice ions undergoes exchange at the surface with one of the ions of the electrolyte. The inequality increases with the amount of surface exposed. The mechanism of exchange is discussed. The distribution of Ca²⁺ and C₂O₄²⁻ between CaC₂O₄·H₂O and solution has been expressed quantitatively, and the distribution coeff. and the no. of mols. of surface C₂O₄²⁻ per g. of solid have been calc. E. S. H.

Hysteresis of water vapour on cellulose. Influence of air. F. WALKER, W. B. CAMPBELL, and O. MAASS (Canad. J. Res., 1937, 15, B, 340—344).—Dry cellulose was exposed at 28° to H₂O vapour from ice at 0° (pressure *p*), then to saturated H₂O vapour, and finally to pressure *p* of H₂O. The difference in H₂O content at pressure *p* before and after saturation was independent of the pressure of air at 10⁻²—10⁻⁵ mm. R. S. B.

Absorption of fats and dialysis of fatty acids. F. L. BREUSCH (Biochem. Z., 1937, 293, 280—294; cf. von Kuthy, A., 1931, 1125).—The solubility of saturated C₁₀, C₁₂, C₁₄, and C₁₆ fatty acids in solutions of salts of bile acids increases as the mol. wt. of the acids decreases. The dialysis of fatty acids and their salts and of lecithin through Cellophane and parchment has been studied. W. McC.

Surface tension of strong electrolytes. M. DOLE (Nature, 1937, 140, 464—465).—An expression for γ has been obtained by postulating a small no. of surface regions where negative ions may be adsorbed from the interior of the solution with a large diminution of potential energy. It gives vals. for KCl in agreement with those found experimentally, including the observed decrease in γ at low concns. L. S. T.

Surface phenomena in the crystallisation of supercooled liquids in thin layers. I. G. L. MICHNEVITSCH, J. F. BROVKO, and A. B. BADADSHAN (Acta Physicochim. U.R.S.S., 1937, 6, 455—472).—

The distribution of crystallisation nuclei on supercooling thin films of betol, together with the variations produced by supercooling in an electric field normal and parallel to the layers, have been examined. C. R. H.

Properties of adsorbed films with repulsive interaction between adsorbed atoms. J. S. WANG (Proc. Roy. Soc., 1937, A, 161, 127—140).—The method employed by Peierls and Bethe in the treatment of order-disorder phenomena is applied to adsorption with positive interaction energy between neighbouring adsorbed atoms. The case of a diat. gas dissociating on adsorption is considered. It is shown that crit. conditions do not occur. Heat of adsorption is calc. in terms of the fraction of surface covered for various interaction energies. An equation analogous to the Clausius-Clapeyron equation is derived for the case of adsorption with dissociation. G. D. P.

Properties of caesium and oxygen films on tungsten. J. B. TAYLOR and I. LANGMUIR (Physical Rev., 1936, [ii], 49, 878—879).—O films prepared by allowing O₂ at 10⁻⁶—10⁻¹⁰ mm. pressure to diffuse through a heated Ag tube on to a W filament require no activation to produce increased electron emission when Cs is adsorbed on them. O-W films undergo a rearrangement when heated in presence of adsorbed Cs, with accompanying changes in electron emission from the Cs-O-W film. In these films [O] is \ll corresponds with a single layer and the heat of evaporation of the O increases from 143—168 kg.-cal. as [O] approaches 0. At pressures < 10⁻⁷ mm., O diffuses into W at temp. as low as 1200° K. A preliminary val. for the heat of diffusion is 83 kg.-cal. L. S. T.

Polarimetric studies of oxide film formation on metals. A. B. WINTERBOTTOM (Nature, 1937, 140, 364—365).—Curves showing the changes in the relative phase retardation of polarised light falling on Cu mirrors during heating and cooling in H₂ and air are reproduced, and the corresponding film thicknesses of oxide have been calc. The magnitude of the first rapid oxidation is \gg that expected on the basis of a sorption-diffusion oxidation theory. L. S. T.

Viscosity of unimolecular films. W. D. HARKINS and R. J. MEYERS (Nature, 1937, 140, 465).—Two methods of measurement are described. Data for the higher fatty acids (C₁₄—20) show that η increases rapidly with the length of the mol. L. S. T.

Determination of the specific surface of barium sulphate. I. M. KOLTHOFF and W. M. MACNEVIN (J. Amer. Chem. Soc., 1937, 59, 1639—1643).—Three methods are described. The simplest is based on the determination of the amount of wool-violet adsorbed in the saturated surface of BaSO₄. Good results are also obtained by a procedure based on the exchange between CrO₄²⁻ and SO₄²⁻ in the surface of BaSO₄. The radioactive method, using Th-B, is limited to well-aged specimens of BaSO₄. E. S. H.

Orientation in films of long-chain esters. A. E. ALEXANDER and J. H. SCHULMAN (Proc. Roy. Soc., 1937, A, 161, 115—127).—Differences found in

the rate of hydrolysis of films on N -NaOH solution are ascribed to differences in the orientation of the component parts of the mols. Inhibition of hydrolysis is due to the protective sheath of short hydrocarbon chains. In agreement with previous results, the work of compression of the short chain to a position beneath the surface increases by a nearly const. amount for each CH_2 group added. The effect of mol. configuration on the vertical component of the apparent dipole moment is discussed. G. D. P.

Multilayers of sterols and the adsorption of digitonin by deposited monolayers. I. LANGMUIR, V. J. SCHAEFER, and H. SOBOTKA (J. Amer. Chem. Soc., 1937, 59, 1751—1759).—Monolayers of several sterols, cholesterol (I), cholesterol (II), and the corresponding *episterols*, ergosterol (III), and calciferol (IV), can be built up as multilayers on Cr plates. The thickness per monolayer (16.6—17.9 Å) agrees with that found by X-ray analysis for 3-dimensional crystals. Digitonin (V) is adsorbed as a visible film (up to 30 Å) from a 0.001M solution on monolayers of (I), (II), and (III), but only slightly on monolayers of the *episterols* or (IV). A similar specificity is observed in the pptn. of the sterols by (V). Penetration of (V) between the sterol mols. of a monolayer causes an expansion to about double the area. The *episterols* give rapidly expanding liquid films, and the normal sterols slowly expanding, very rigid films; the former are hydrophobic, and the latter hydrophilic and more stable. E. S. H.

Spreading and expansion phenomena of unimolecular layers [of protein]. G. T. PHILIPPI (Chem. Weekblad, 1937, 34, 626—633).—An apparatus is described for studying the properties of unimol. films by measurements of surface pressure and change in vol. with a travelling Po electrode; the apparatus has been used in the investigation of the spreading properties and the structure of protein films. Experiments with ovalbumin, serum-albumin, lactoglobulin, insulin, and pepsin show that they all possess approx. the same characteristic surface, about 1 sq. m. per mg., which is independent of the p_H of the substrate; since the surface for the NH_2 -acid residues is also roughly const. at 21—22 Å², it would appear that the films are homogeneous. The latter are “dehydrated” when compressed to an area of 0.9—1.0 sq. m. per mg. Each protein mol. is surrounded by a unimol. H_2O layer. Protein films are considered as homogeneous, unimol. layers of polypeptides. The side-chains in the peptide mol. lie on both sides of the layer and the peptide groups in the expanded film are associated. Since the films consist of three layers, an upper non-polar layer having hydrocarbon characteristics, a middle layer of associated peptide groups, and a lower layer of polar groups, they may be conveniently termed “triplex films.” The surface potential and the film pressure vary considerably with the p_H and the salt content of the substrate, the p_H curve being highly characteristic for all proteins. The electrical properties of such films are discussed in some detail. Ovalbumin forms a macroscopic coherent film under certain conditions but this is not

the case with serum-albumin. Protein films are very elastic. S. C.

Highly polymerised compounds. CLXVII. Influence of temperature on osmotic pressure of solutions of substances of high mol. wt., and their molecular state. G. V. SCHULZ (Z. physikal. Chem., 1937, 180, 1—24).—The osmotic pressure, P , of 1—3% solutions of cellulose nitrate in $COMe$, and of polystyrene in PhMe rises with the temp., θ , more slowly than it would if $\propto \theta$, indicating the absence of appreciable association. Differential heats of dilution, calc. from the variation of p with θ , are positive. As the concn. approaches zero the solutions approximate to ideal dil. solutions. Over the above concn. range the solutions follow the osmotic pressure equation for “regular” solutions more closely than the ideal van t' Hoff equation, but the deviations from the latter are due to the non-ideal character of the entropy as well as to solvent-solute interaction. The results cannot be reconciled with the view that the osmotic pressure of solutions of substances of high mol. wt. is increased by intramol. Brownian movement (cf. A., 1935, 579). R. C.

Cryoscopic studies on bases in sulphuric acid: ionisation of di-ortho-substituted benzoic acids. H. P. TREFFERS and L. P. HAMMETT (J. Amer. Chem. Soc., 1937, 59, 1708—1712).— $PhNO_2$ is incompletely ionised in H_2SO_4 . Completely ionised monacid bases (e.g., $COPh_2$, $BzOH$) exhibit small deviations from ideal behaviour. A new type of reaction with H_2SO_4 , involving the formation of acyl ions of the type RCO^+ as well as $RCO_2H_2^+$, has been observed with 2:6- $C_6H_3Me_2 \cdot CO_2H$ and two of its derivatives. E. S. H.

Properties of electrolytic solutions. XX. F.p. of solutions of electrolytes in benzene. D. A. ROTHROCK, jun., and C. A. KRAUS (J. Amer. Chem. Soc., 1937, 59, 1699—1703; cf. A., 1935, 561).—Modified apparatus is described. Results for NH_4B_3 picate and iodide and NBu_4ClO_4 (0.001—0.02N) in C_6H_6 show marked association; those for the picate agree with a mass action equilibrium between dipoles and quadripoles at all concns. A dipole-quadrupole equilibrium holds for $NHBu_3I$ at low concns., but at higher concns. more complex structures are formed; two types of quadripoles must be assumed to be formed. With $NHBu_3ClO_4$ highly complex structures are formed even at low concns. E. S. H.

Diamagnetic susceptibilities of dissolved and hydrated salts. F. E. HOARE and G. W. BRINDLEY (Proc. Physical Soc., 1937, 49, 619—628; cf. this vol., 131).—Available data show that the effective susceptibilities (χ) for the ions in aq. solutions of salts are additive within 1%. Systematic differences are shown by the vals. of χ for ions in solution and in crystals. For small univalent ions and all bivalent ions the solution vals. are smaller, whereas these are greater for large univalent ions. New measurements of χ are recorded for hydrated $MgCl_2$, $CaCl_2$, $BaCl_2$, $SrBr_2$, and $BaBr_2$, and a comparison of data obtained by three different methods shows that the vals. of χ derived from hydrated crystals by assuming the H_2O of hydration to have the same χ as ordinary

H₂O, approximate more closely to the vals. for salts in solution than to the vals. afforded by the anhyd. salts.

N. M. B.

Colloidal gases. IV. Preparation and properties of colloiddally dispersed gases and their significance in nature and industry. A. KRAUSE and K. KAPITAŃCZYK (Kolloid.-Z., 1937, 80, 273—286; cf. A., 1935, 699).—The prep. of sols of air, O₂, N₂, H₂, CO, CH₄, C₂H₄, and C₂H₂ in conc. aq. NaOH is described. The conc. sols. are stable for some hr. at 5°, and the stability is increased by dilution, lowering of temp., or addition of protective colloids. The particle sizes of the dispersions have been determined; with O₂, N₂, CH₄, and air, gas particles of 2.9—4.6 mμ. diameter are observable in the ultra-microscope owing to the great difference in n of the two phases. The Brownian movement and Tyndall effect have been examined. The colours of the sols vary with increasing particle size from green through yellow and pink to white. The production of foams from conc. aq. NaOH and H₂O₂ is discussed.

E. S. H.

Nucleus formation on ions in supersaturated vapours. T. GLOSIUS (Kolloid.-Z., 1937, 80, 269—273).—The rate of formation of liquid droplets in air, supersaturated with H₂O by sudden expansion, has been deduced theoretically and tested experimentally.

E. S. H.

Theory of lyophilic colloids. S. M. LIEFATOV (Uspechi Chim., 1935, 4, 933—957).—A review.

CH. ABS. (e)

So-called longitudinal scattering of light. M. KATALINIĆ (Z. Physik, 1937, 106, 439—452).—Measurements of the scattering of light through small angles by single particles of a mono-disperse colloidal solution or suspension are reported. The haloes given by single particles in H₂O distilled under various conditions are discussed.

H. C. G.

Precipitation of ferric hydroxide, especially at temperatures above 100°. T. KATSURAI (Kolloid.-Z., 1937, 80, 291—294).—The hydrolysis of FeCl₃ in presence of NaCl or BaCl₂ at <100° in an autoclave has been studied. At 120—140° the sediment vol. decreases with increasing concn. of the added salt. The light absorption and turbidity of mixtures of aq. FeCl₃ with varying concns. of NH₃ have been determined; max. turbidity is observed at medium [NH₃], and for λ 615 mμ. the Lambert-Beer law holds. The max. sediment vol. is obtained with the mixture of max. turbidity at room temp.

E. S. H.

Coagulation of colloids. XVIII. Zonal effect and antinormal change of opacity during the slow coagulation of colloidal manganese dioxide. S. S. JOSHI and P. V. J. RAO (J. Indian Chem. Soc., 1937, 14, 388—394; cf. this vol., 410).—The change of opacity with time has been studied with colloidal MnO₂ coagulated with KCl, AcOH, and BaCl₂. Opacity and degree of coagulation do not necessarily run parallel, and in the later stages of coagulation there is a decrease in opacity. Low [KCl] gives a decrease in opacity from the start. The opacity curves are broken up into "zones" by discontinuous changes, especially for medium concn. of the coagulant.

R. S. B.

Electrolytic coagulation of weakly solvated sols and electrolyte activity. VIII. Determination of exact coagulation values by turbidity measurements. II. Measurements in the infra-red with the photo-cell. H. A. WANNOW and K. HOFFMANN. **IX. Theory of Burton's rule.** W. OSTWALD (Kolloid.-Z., 1937, 80, 294—304, 304—315; cf. A., 1936, 1200).—VII. The measurement of turbidity of dil. sols from the intensity of scattered light and of conc. sols from the intensity of transmitted light is described and results are reported for As₂S₃ sols containing varying amounts of pptg. electrolytes. The change in intensity of transmitted light with time after adding an electrolyte is parabolic; the decrease in intensity with increasing concn. or activity coeff. of the added electrolyte gives an S-shaped curve. The turning-point of this curve is considered to afford a better measure of coagulation val. than that given by an arbitrary standard turbidity.

IX. Published data on the coagulation of different sols by electrolytes are in accordance with the theories developed by Ostwald.

E. S. H.

Formation of Liesegang rings in the precipitation of basic mercuric chloride in the absence of a gel. B. N. SEN (Z. anorg. Chem., 1937, 234, 63—64).—When aq. Na₂B₄O₇ is carefully poured onto aq. HgCl₂ in a narrow tube rings of ppt. are formed.

F. J. G.

Protective colloids, protalbinic and lysalbinic acids.—See A., II, 448.

Ageing of fresh precipitates. XIV. Ageing of silver chloride as indicated by the speed of penetration of bromide ions into the solid. I. M. KOLTHOFF and H. C. YUTZY (J. Amer. Chem. Soc., 1937, 59, 1634—1639; cf. this vol., 363).—The speed of penetration of Br⁻ into pptd. AgCl is not determined solely by the rate of recrystallisation; on the other hand it gives an indication of the rate of ageing during the early stages. Gelatin and wool-violet retard, but do not prevent, the penetration.

E. S. H.

Dilatation of gelatin under the influence of salts. J. H. C. MERCKEL and E. H. WIEBENGA (Kolloid.-Z., 1937, 80, 315—319).—The degree of swelling of gelatin in aq. Na salt solutions at p_H 3.75 has been determined and a bilinear relation between the salt concn. for a given amount of swelling and the lyotropic no. is derived.

E. S. H.

Effect of alcohols on the time of set of alkaline silica gels. L. A. MUNRO and C. A. ALVES (Canad. J. Res., 1937, 15, B, 353—359).—The setting time is reduced considerably by MeOH, EtOH, PrⁿOH, PrⁱOH, BuⁿOH, BuⁱOH, *sec*.-BuOH, BuⁿOH, and COMe₂, and slightly by glycol, whilst it is increased by glycerol. The associated p_H changes are discussed. The effects show an approx. parallelism with the dielectric consts. of the alcohols, but several anomalies are pointed out.

E. S. H.

Crystallisation of iodine and iodides in gels. M. A. MILLER (Kolloid.-Z., 1937, 80, 327—333).—Published work is reviewed.

E. S. H.

Base exchange in casein. E. GRAF (Kolloid-Beih., 1937, 46, 229—310).—The structure of the

casein (I) micelle is elastic but its exchange reactions qualitatively resemble those of permutit. It possesses a metastructure and exhibits intramicellar exchange properties. Electrometric titration indicates a base-fixing capacity of 1.6 m.-equiv. per g. of (I). Swelling of (I) diminishes the force of attraction for adsorbed cations and facilitates base exchange. In EtOH-H₂O solution (I) shows neutral salt adsorption effects which increase with the proportion of EtOH used. In EtOH solutions increasing concns. of exchangeable ions lead to dispersion of (I). CH₂O-(I) in the dehydrated condition has exchange properties similar to those of (I) but in aq. dispersion the exchange capacity is < that of (I); this is attributed to its smaller swelling capacity. A. G. P.

Dispersion temperature of an intracellular protein, ascaridin. E. FAURÉ-FREMIET and J. FILHOL (J. Chim. phys., 1937, 34, 444—451).—Ascaridin (I) dissolves reversibly in H₂O at 50—51°. KCl is without effect, but, in general, added salts raise or lower the dispersion temp. θ , specifically and to an extent \propto salt concn. For K salts, the θ vals. are in the order: citrate > SO₄' > OAc' > Cl' > Br' > I' > CNS'. (I) is transformed into an insol. form, and this change is fairly rapid in solution at high temp. X-Ray examination shows that (I) exists in an amorphous and a semi-cryst. form. The above changes of (I) are compared with the thermoelastic transformation of elastoidin. J. G. A. G.

Cyclol hypothesis and the "globulin" proteins.—See A., II, 475.

Measurement of depolarisation of Tyndall light with solutions of proteins, particularly fibrinogen.—See A., III, 412.

Coacervation. H. G. B. DE JONG (Kolloid-Z., 1937, 80, 221—231, 350—360).—A review of published work. E. S. H.

Thixotropic viscosity. S. A. GLIKMAN (J. Phys. Chem. Russ., 1935, 6, 511—512).—The term has reference to the variable η connected with the presence of elements of gel-like structure in the sol. CH. ABS. (e)

Dissociation constants of organic acids. XIX. Unsaturated acids. W. L. GERMAN, G. H. JEFFERY, and A. I. VOGEL (J.C.S., 1937, 1604—1612; cf. this vol., 135).—True dissociation const. have been calc. from conductivity measurements, and from the results of potentiometric titration, for acrylic, *trans*-crotonic, $\beta\beta$ -dimethylacrylic, tetrolic, furoic, and glutaconic acid. Evidence for the *trans*-configuration of glutaconic acid, m.p. 138°, is afforded by the similarity of K_1/K_2 and of the titration curves to those for fumaric acid. F. L. U.

Basic strengths of tertiary amines, phosphines, and arsines. W. C. DAVIES and H. W. ADDIS (J.C.S., 1937, 1622—1627).—Dissociation const. of bases in 30% or 50% EtOH have been determined at 20°, for NPhMe₂, alone and with various nuclear substituents, NPhEt₂, PPhMe₂ and derivatives, and mesityldimethylarsine. The strengths of comparable bases are in the order phosphine > amine > arsine. Me in the *o*-position increases the strength of a given base, and Et₂ are stronger than Me₂ bases (N and P).

The effects of nuclear substituents are generally weaker in phosphines than in amines. The velocity coeff. for the reaction with MeI increases with the dissociation const. of the base within the group of amines, but this rule does not hold when comparing together amines, phosphines, and arsines. F. L. U.

Biologically active 4-ketohexuronic acids (ascorbic and isoascorbic acids).—See A., III, 440.

Individual activity coefficients of ions in aqueous solutions. J. KIELLAND (J. Amer. Chem. Soc., 1937, 59, 1675—1678).—The activity coeffs. of 130 inorg. and org. ions in H₂O at different ionic concns. have been calc. from published data and tabulated. E. S. H.

Activity coefficients of cadmium iodide. R. G. BATES and W. C. VOSBURGH (J. Amer. Chem. Soc., 1937, 59, 1583—1585).—Activity coeffs. for CdI₂ in H₂O (from 0.001M to saturation) have been derived from e.m.f. data for the cell Cd(Hg)|CdI₂(m)|CdI₂(m), Hg₂I₂|Hg. E. S. H.

Application of the phase rule to crystal systems. D. BALAREV (Monatsh., 1937, 71, 30—45).—The pressure-temp. relations for several reactions of the type *A* (cryst.) \rightleftharpoons *B* (cryst.) + *C* (gas) have been determined and the results are discussed in terms of the phase rule. The gas pressure at a given temp. is influenced by the no. of points of contact and the orientation of the crystal phases. E. S. H.

Extension of Schreinemakers' method to multi-component systems. F. PERELMAN (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 379—386).—Graphical methods are described (cf. A., 1893, ii, 260). R. T.

Measurement of transition points of electrolytic iron by hydrogen diffusion. W. R. HAM (Physical Rev., 1936 [ii], 49, 643).—Diffusion of H₂ provides a sensitive and accurate means for the determination of transition points of metals. With Fe, the transition at 900° results in a large change in diffusion rate. The break is abrupt and independent of [H₂] over a range corresponding with H₂ pressures of 10—73 cm. of Hg. L. S. T.

Compound formation in the binary systems Ba(NO₃)₂-KNO₃ and Ba(NO₃)₂-NaNO₃. J. E. RICCI (J. Amer. Chem. Soc., 1937, 59, 1763—1764).—Published data show that these systems, hitherto represented as of the simple eutectic type, are characterised by the compounds 2Ba(NO₃)₂·KNO₃, 2Ba(NO₃)₂·NaNO₃, and probably Ba(NO₃)₂·2KNO₃. E. S. H.

Vapour pressure of water over fused sodium and potassium hydroxide. A. M. BAUMAN (J. Appl. Chem. Russ., 1937, 10, 1165—1172).—The *v.p.* of H₂O has been determined in the systems MOH-H₂O, MOH-H₂O-M₂CO₃, and MOH-M₂CO₃-MCl-H₂O, at 300—380° (M = Na or K). R. T.

Sodium vapour potential and the Gay Lussac reaction. O. BARTA (Z. Elektrochem., 1937, 43, 733—743).—From e.m.f. data for the cells C + Na (gas)|Na₂CO₃|O₂; Na (gas)|Na₂CO₃|O₂; Na (liq.)|Na₂CO₃|O₂; and Na (liq.)|Na₂O (solid)|O₂ the const. of the Gay Lussac reaction Na₂CO₃ + 2C = 2Na +

3CO have been evaluated and compared with manometric observations. The dissociation const. of Na_2CO_3 is deduced. The energy of formation and entropy of Na_2O calc. from the data are in accord with the vals. deduced from the Na_2O cell.

J. W. S.

Physico-chemical analysis in connexion with nitric acid treatment of phosphates. II. Solubility of calcium nitrate in aqueous nitric acid. A. P. BELOPOLSKI and V. V. URUSOV (J. Appl. Chem. Russ., 1937, 10, 1178—1182).—The solubility of $\text{Ca}(\text{NO}_3)_2$ (I) and of its dihydrate falls rapidly with increasing $[\text{HNO}_3]$; (I) is the only solid phase separating in presence of $>1.46\%$ HNO_3 at 50° , whilst with $<1.46\%$ HNO_3 the di- and tri-hydrate (II) are formed. (II) melts congruently at 51.1° , and has a closed field of crystallisation, between 74 and 77% (I) and 0—1% HNO_3 .

R. T.

Physico-chemical study of the solubility of caffeine in [aqueous] sodium benzoate. M. CHAMBER, J. BOUVIER, and P. DURON (J. Pharm. Chim., 1937, [viii], 26, 216—231).—The system caffeine- NaOBz - H_2O has been studied at temp. between 37° and 90° . The equilibrium data are said to afford evidence of the existence of compounds which contain caffeine and NaOBz in the ratios 1 : 1 and 1 : 2.

J. L. D.

Ternary systems: water-*m*-cresol-benzene and -toluene. Determination of water content of *m*-cresol. F. F. RATMAN (J. Appl. Chem. Russ., 1937, 10, 1233—1236).—The phase diagrams of the systems are identical. The H_2O content y of *m*-cresol is determined by adding 0.16 g. of H_2O to 5 ml. of *m*-cresol, followed by C_6H_6 from a burette until there is permanent turbidity, when $y = 18/(x + 2)^{1/2} - 0.03x + 0.0025x^2 - 0.00003x^3 - 3.2$, where x is the vol. of C_6H_6 added.

R. T.

Heat of formation and specific heat of aluminium carbide. S. SATOH (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 757—764).—The mean sp. heat (c) of Al_4C_3 has been determined at 0— 99.6° , 0— 244° , and 0— 320.5° , and is given by $c = 0.2282 + 2.12 \times 10^{-4}t - 2.842 \times 10^{-8}t^2$. The heat of formation of Al_4C_3 , calc. from equilibrium data for the reaction $4\text{AlN} + 3\text{C} = \text{Al}_4\text{C}_3 + 2\text{N}_2$, is 63,200 g.-cal.

R. S. B.

Conductivity and p_K values of calcium hydroxide solutions at 25° . F. M. LEA and G. E. BESSEY (J.C.S., 1937, 1612—1615).

F. L. U.

Conductance of potassium ferrocyanide solutions. C. W. DAVIES (J. Amer. Chem. Soc., 1937, 59, 1760—1761).—The results of Jones and Jelen (this vol., 138) are interpreted in terms of ion association.

E. S. H.

Influence of strong electrolytes and mercuric chloride on the conductivity of aqueous benzoic acid. S. S. JOSHI and D. N. SOLANKI (J. Indian Chem. Soc., 1937, 14, 323—343).—The sp. conductivity (κ) of 0.01N—0.005N aq. BzOH has been determined at 25° in presence of N/64—N/4096 LiCl , NaCl , KCl , RbCl , CsCl , BaCl_2 , HCl , and HgCl_2 . κ is additive except for HCl and HgCl_2 , and hence there is no influence of neutral salts on the degree of dissociation

of BzOH . The decrease of κ in presence of HCl is due to the common ion effect, and in presence of HgCl_2 at high dilution to hydrolysis of the salt. The dissociation const. of BzOH is 6.24×10^{-5} at 25° .

R. S. B.

Relation between electrical conductivity and viscosity of fused salts. J. FRENKEL (Acta Physicochim. U.R.S.S., 1937, 6, 339—346).—Theoretical. The recent extension of Walden's rule, connecting electrical conductivity, κ , and η of ionic solutions, to a general law which can be expressed by $\kappa^m\eta = \text{const.}$, is explained on the basis of the author's theory of the nature of thermal energy in the liquid state (cf. A., 1936, 1189).

C. R. H.

Transference numbers and ion mobilities of electrolytes in deuterium oxide and its mixtures with water. L. G. LONGSWORTH and D. A. MAC-INNES (J. Amer. Chem. Soc., 1937, 59, 1666—1670).—In solutions of KCl and H(D)Cl in H_2O — D_2O mixtures the conductance of Cl^- varies almost linearly with the mol. fraction of D_2O . The corresponding curve for the H(D)^+ component is complex. Limiting vals. of the ion conductances in D_2O have been computed from data for solutions of NaCl , KCl , and H(D)Cl at different concns. in nearly pure D_2O .

E. S. H.

Influence of parchment paper membranes on the transport of electrolyte in 0.1N-hydrogen bromide. A. WAGNER (Chem. Listy, 1937, 31, 313—317).—The Hittorf transport no. of H^+ in 0.1N- HBr is 0.815 in absence, and 0.833 in presence, of a parchment paper diaphragm.

R. T.

Transport measurements with cuprous oxide. J. GUNDERMANN and C. WAGNER (Z. physikal. Chem., 1937, B, 37, 155—156).—The transport no. of the Cu^+ ion at 1000° is 5×10^{-4} , independent of the O_2 pressure, p . The partial conductivity due to the Cu^+ ion is approx. $\propto p^{1/7}$. These results confirm the theory previously advanced (A., 1933, 887).

R. C.

Effect of the speed of rotation on the electrode potentials of copper and zinc. C. G. FINK and H. B. LINFORD (Trans. Electrochem. Soc., 1937, 72, Preprint 9, 147—155).—Measurements of the cathode potential of Cu in aq. CuSO_4 and of Zn in aq. ZnSO_4 indicate a change of potential in the positive direction when the cathode is rotated, the magnitude of the change depending on the ionic concn. of the electrolyte and speed of rotation. The max. effect occurs at approx. 8000 r.p.m.

J. W. C.

Attempted use of crystals as calcium electrodes. R. S. ANDERSON (J. Biol. Chem., 1936, 115, 323—326).—Attempts to determine $[\text{Ca}^{++}]$ potentiometrically, using crystals of CaCO_3 or CaF_2 as electrodes, failed because of the high electrical resistance. The work of Tendeloo (A., 1936, 443) is criticised.

E. S. H.

Attempted use of crystals as calcium electrodes. II. R. S. ANDERSON (J. Amer. Chem. Soc., 1937, 59, 1420—1422; cf. preceding abstract).—Further experiments on the measurement of e.m.f. of concn. cells by CaCO_3 or CaF_2 electrodes are inconclusive.

E. S. H.

Nature of the glass electrode potential. II. Effect of water on the potential of the glass electrode. H. YOSHIMURA (Bull. Chem. Soc. Japan, 1937, 12, 359—366; cf. A., 1936, 682).—The deviation of $\Delta E/\Delta p_H$ from the theoretical val. decreases when the electrode is submerged in H_2O and attains a const. val. in a week. Thereafter, if one side is drier than the other, a difference of potential is exhibited, but this can be explained by the theories of Dole (A., 1935, 170), Gross and Halpern (A., 1934, 601), and Lark-Horovitz (A., 1931, 546). F. R. G.

Mode of action of the glass electrode. G. HAUGAARD (Tids. Kjem., 1937, 17, 87—88).—Comparison of the variation with time of base exchange and electrode potential of glass in contact with 0.1N-HCl shows that the glass electrode is a H_2 electrode the $[H_2]$ of which has not reached equilibrium. M. H. M. A.

Glass electrode and its applications. I. K. MARUYAMA and H. HAGISAWA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 737—748).—The asymmetric p.d. of Haber glass electrodes has been measured by a vac.-tube potentiometer. The titration of H_2SO_4 in presence of $KMnO_4$, $K_2Cr_2O_7$, $KClO_3$, $KBrO_3$, KIO_3 , and $CuSO_4$, and of HNO_3 , $H_2Cr_2O_7$, and H_2SO_3 has been studied. R. S. B.

Glass electrode. I. Glass electrode errors at 30°. II. Properties of lithium glass electrodes. J. L. GABBARD and M. DOLE (Trans. Electrochem. Soc., 1937, 72, Preprint 18, 249—256).—I. Errors in the use of ordinary glass electrodes are tabulated and compared with results of other authors.

II. The results of Sokolov and Passinski (A., 1932, 915) with Li glass electrodes could not be reproduced and the electrodes failed to function accurately even in the neutral p_H range. F. R. G.

Oxidation-reduction potential of the system oxalacetic acid-l-malic acid. K. LAKI (Z. physiol. Chem., 1937, 249, 63—70).—In suspensions of pigeon breast muscle oxalacetic acid inhibits the action of succinic dehydrogenase and hence interference by fumarate with the electrometric determination of the oxidation-reduction potential of the system oxalacetic acid \rightleftharpoons l-malic acid does not occur. At p_H 7.0 and 37° the potential is -0.169 ± 0.009 v. W. McC.

Electrolytic reduction potentials of organic compounds. XXIV. XXV. Standard electrolytic reduction potential and redox potential. I. TACHI (Bull. Agric. Chem. Soc. Japan, 1937, 13, 692—697, 698—704; cf. this vol., 415).—XXIV. Half wave potentials ($\Pi_{\frac{1}{2}}$) have been determined for Ac_2 , $COPhMe$, benzoylacetone (I), benzil, benzoin, and azobenzene (II) and they show satisfactory constancy with changes in concn. ($\Pi_{\frac{1}{2}}$) can be taken as a standard electrolytic potential. ($\Pi_{\frac{1}{2}}$)— p_H curves for (I) and (II) are given.

XXV. ($\Pi_{\frac{1}{2}}$) for neutral-red at a definite p_H is const. and independent of concn.; when referred to the normal H_2 electrode it agrees with the redox potential. Reduction potential— p_H curves are given. J. N. A.

Energy hump in chemistry. I. W. D. BANCROFT and J. E. MAGOFFIN (J. Franklin Inst., 1937,

224, 283—310).—In order to explain reduction-oxidation systems which do not readily fit in with the electromotive theory, the hypothesis of the energy "hump" is put forward. It is assumed that the reaction does not occur because none of the mols. attain a sufficiently high energy level under ordinary conditions. For a reaction which can be made to occur electrolytically the height of the energy hump is the difference between the free energy of the system and the voltage energy necessary for the reaction to take place. The hump is decreased with increasing concn. or temp., and may be eliminated by the use of suitable catalysts. The theory is applied to one-way electrodes, e.g., cysteine-cystine and sulphite-sulphate. Oxidation and reduction potentials are set up only if an electron transfer between the inert metal electrode and the oxidisable or reducible substance does not involve surmounting an energy hump. The catalytic decomp. of $KClO_3$ by MnO_2 is considered from this viewpoint. The theory is also applied to overvoltages, particularly in connexion with the reducing power of $CrCl_2$. A. J. M.

Decomposition potential of aluminium oxide. I. P. TVERDOVSKI and V. S. MOLTSCHANOV (J. Appl. Chem. Russ., 1937, 10, 1011—1019).—The decomp. potentials of Na_3AlF_6 (I) and of (I)— NaF , $-AlF_3$, and $-Al_2O_3$ mixtures vary linearly with temp. (965—1100°), showing that the electrolytic process is the same in all cases, and consists in decomp. of AlF_3 . With time, the $[NaF]$ of the electrolyte rises, and Al is pptd. at the cathode as the result of a substitution reaction. F liberated at the anode reacts with Al_2O_3 , and the displaced O_2 reacts with the C anode to yield CO_2 . R. T.

Overvoltage on hydrogen electrodes. K. WIRTZ (Z. physikal. Chem., 1937, B, 36, 435—443).—Measurements of the overvoltage, η , on various electrodes showed that as the activity of the electrode increases the val. of b in Tafel's equation falls, and η in some cases approaches zero asymptotically as the current strength falls. It is inferred that overvoltage cannot be wholly explained by supposing that the loss of charge represents the slowest step in the electrolytic separation of H. With an electrode at which loss of charge is probably slow there is no catalysed interchange between H and D_2O . R. C.

Polarographic studies with the dropping mercury cathode. LXX. Hydrogen overpotential in mixtures of light and heavy water and the separation coefficient. J. HEYROVSKÝ. LXXI. Changes of polarisation when using small anodes. V. MAJER (Coll. Czech. Chem. Comm., 1937, 9, 345—359, 360—376).—LXX. Theoretical. The results of Novák (this vol., 414) are discussed and a formula expressing the H overpotential in acid D_2O — H_2O mixtures is deduced. The electrolytic separation coeff. for H and D at cathodes with high overpotential is discussed.

LXXI. Apparatus for the automatic registration of current-voltage and "potential-voltage" curves (the course of the electrode potential during electrolysis with a stable Hg anode and a dropping Hg cathode) is described. In NO_3' and SO_4'' solutions considerable

changes in anode potential occur if the anode is small. In Cl^- solutions the addition of Hg_2Cl_2 stabilises the potential of large anodes, but does not prevent passivity of small anodes. In OH^- solutions red HgO does not remove changes of anodic polarisation. These phenomena are explained by supersaturation of the anodic layers and by the formation of finely dispersed HgO of increased solubility. E. S. H.

Passivity of iron and steel in nitric acid solution. XX. Y. YAMAMOTO (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 811—836; cf. this vol., 468).—The potential of an Fe anode in the active state is decreased when the ionisation of the Fe is accelerated by the passage of a current. The Fe becomes passive owing to O developed by electrolysis, and the appearance of passivity is accompanied by an increase in potential, which is not decreased by electrolysis. On applying a p.d. to the passive Fe electrode the potential of the anode is at first unaffected, but falls when the applied voltage reaches a definite val. owing to ionisation and dissolution of the Fe. A black oxide is formed. R. S. B.

A standardisation of the p_H scale. D. I. HITCHCOCK (Trans. Electrochem. Soc., 1937, 72, Preprint 10, 157—159).—An attempt is made to rationalise the p_H scale on the basis of determinations of E_0 obtained by the use of buffer solutions each containing a weak acid of known ionisation const. and one of its completely ionised salts. J. W. C.

Penetration of electrolytic cadmium deposits into iron. G. S. VOZDVISHENSKI and L. A. BRAMINA (J. Appl. Chem. Russ., 1937, 10, 1173—1177).—The e.m.f. of the element Cd-plated Fe[5% NH_4NO_3] Pt rises gradually from that characteristic of Cd to that of Fe, suggesting the presence of an intermediate layer of Fe—Cd alloy. R. T.

Electrolytic preparation of ammonium persulphate. I. Potential balance data. V. V. STENDER and I. G. SHORITZKI (J. Appl. Chem. Russ., 1937, 10, 999—1010).—The potentials at Pb cathodes (c.d. 0.02—1 amp. per sq. cm.) and Pt anodes (c.d. 0.07—8 amp. per sq. cm.), in the electrolysis of 15—35% $(\text{NH}_4)_2\text{SO}_4$ in 15—35% H_2SO_4 , at 10°, 25°, and 35°, have been determined. R. T.

Electrolytic processes in the magnetic field. C. G. FINK and M. A. COLER (Trans. Electrochem. Soc., 1937, 72, Preprint 8, 115—145).—An investigation of certain effects arising from submitting an electrolytic cell to the influence of a direct magnetic field. Many cells, in which a steady d.c. process is normally sustained, exhibit large and reproducible changes in conductivity when subjected to certain magnetic fields. Suggested applications of the phenomenon include the use of standardised magneto-conductive cells in the calibration of strong direct magnetic fields, for controlling the intensity of such fields, and in conjunction with suitable solenoids, as const.-current devices. J. W. C.

Velocity of a coupled reaction. T. DE DONDER (Bull. Acad. roy. Belg., 1937, [v], 23, 685—688).—Mathematical. A. J. E. W.

Rate constants of reactions of atoms and radicals as derived from different sources. J. R. BATES (Chem. Rev., 1935, 17, 401—407).—A discussion. CH. ABS. (e)

Singular points of diagrams of isotherms of reactions. N. I. STEPANOV (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 219—253).—Theoretical. R. T.

Collision, co-ordination, diffusion, and reaction velocity in condensed systems. E. RABINOVITCH (Trans. Faraday Soc., 1937, 33, 1225—1233; cf. A., 1936, 1185).—Theoretical. J. W. S.

Propagation of explosion waves in different gases. H. MURAOUR, A. MICHEL-LÉVY, and E. BURLOT (J. Phys. Radium, 1937, [vii], 8, 330—331).—The visible trace of an explosion wave is most intense when the sp. heat of the surrounding gas is low and its mol. wt. high. F. J. L.

Optical determination of labile products in flames. V. KONDRATEEV (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 363—378).—The study of combustion of gases from emission and absorption spectra data is discussed. R. T.

Reaction between nitric oxide and atomic oxygen. W. H. RODEBUSH (Chem. Rev., 1935, 17, 409—412).—The pressure-dependence of the duration of the afterglow in the reaction of NO and O agrees with the hypothesis that this reaction occurs by triple collisions. CH. ABS. (e)

Reaction of deuterium atoms with methane at high temperatures. E. W. R. STEACIE (Canad. J. Res., 1937, 15, B, 264—273; cf. A., 1935, 1087).—Data obtained at 250—500° for the reaction $\text{D} + \text{CH}_4 = \text{CH}_3\text{D} + \text{H}$ lead to the energy of activation 13 ± 2 kg.-cal., consistent with vals. obtained by other methods. J. G. A. G.

Flame of carbon monoxide and oxygen. II. Influence of the composition of the mixture on the intensity of the visible radiation from the flame. H. KONDRATEEVA and V. KONDRATEEV (Acta Physicochim. U.R.S.S., 1937, 6, 625—636; cf. A., 1936, 1469).—At $p_{\text{CO}} = 40$ mm. a decrease in light yield is found with $p_{\text{O}_2} > 20$ mm., whilst with $p_{\text{O}_2} = 20$ mm. the decrease is obtained with $p_{\text{CO}} > 40$ mm. This is attributed to quenching of chemiluminescence, the quenching consts. being 0.034 and 0.162 mm.^{-1} for CO and O_2 , respectively. The greater val. for O_2 is attributed to the possible process $\text{CO}_2^* + \text{O}_2 \rightarrow \text{CO}_2 + 2\text{O}$, leading to branching of reaction chains. With $p_{\text{CO}} + p_{\text{O}_2} = 57$ mm., an increase in light yield is obtained with increasing [CO], ascribable in part to quenching of chemiluminescence. In all cases deviations from the theoretical quenching curves indicate a change in reaction mechanism. Addition of N_2 at $p_{\text{CO}} = 40$ mm., $p_{\text{O}_2} = 20$ mm. causes an increase in total combustion, attaining a max. at $p_{\text{N}_2} = 100$ mm. The change in light yield indicates that the mechanism is changed and involves oxides of N. J. W. S.

Mechanism of flame movement. IV. The vibratory period. H. F. COWARD, F. J. HARTWELL, and E. H. M. GEORGESON (J.C.S., 1937, 1482—1489).—

The vibrations of the flame in air-CH₄ mixtures in tubes closed at one end correspond with the fundamental note or a low harmonic of the whole column of gas, as given by Lees' formula. The vibrations could be suppressed by partly closing the end of the tube, by providing gauze-covered slits along its walls, or by using a tube of square cross-section.

F. J. G.

Critical conditions of the reaction of oxidation of ethane. P. SADOVNIKOV (Acta Physicochim. U.R.S.S., 1937, 6, 419—440).—From experiments with C₂H₆-O₂ mixtures at 600—790° and at 30—180 mm., it is shown that there are inter-related crit. vals. of pressure, temp., and diameter of reaction vessel below which the reaction does not take place.

C. R. H.

Reaction chains in the decomposition of organic compounds. L. A. K. STAVELEY and C. N. HINSHELWOOD (J.C.S., 1937, 1568—1573).—NO inhibits chain reactions by removing free radicals. Evidence obtained in this way is summarised to indicate the relative importance of chain processes and simple rearrangements to saturated products in a no. of org. gas reactions. In some reactions the contribution of the chain process is negligible; in others free radicals are formed in only a few of the primary acts, although they may give rise to long chains. Recognition of, and allowance for, the part played by chain processes leaves the theory of the mechanism of activation essentially unchanged.

F. J. G.

Calculation of the rate of elementary association reactions. E. WIGNER (J. Chem. Physics, 1937, 5, 720—725).—Some simple reactions cannot be calc. by the present form of the transition state method, e.g., association of atoms to a mol. by three-body collision. A formula is derived for the rate of reactions of the types, $2B + A = B_2 + A$ and $A + B + C = AB + C$. In such reactions the exact shape of the energy surface is not so important as in reactions involving activation energies. By determining the probability of a decrease of the relative energy of two atoms below zero energy an upper limit for the rate of association reactions under the influence of a third body is found. The relation of this approx. calculation to the rigorous solution of the problem is discussed. Calc. vals. agree fairly well numerically with the experimental vals. for the recombination of I atoms (A., 1936, 1348). The calc. vals. are slightly low and reasons for this discrepancy are considered.

W. R. A.

Gaseous polymerisations. J. B. HARKNESS, G. B. KISTIAKOWSKY, and W. H. MEARS (J. Chem. Physics, 1937, 5, 682—694).—Gaseous polymerisations have been studied by following pressure changes and by analysis. Styrene is stable to about 400°, when a slow polymerisation reaction sets in, but apparently does not proceed to any marked extent since at 420° the decomp. reaction predominates. CH₂:CH·OAc does not polymerise at pressures <1 atm. Chloroprene begins to polymerise at 230° but at 260° decomp. predominates. CMe:CH does not polymerise readily and isomerisation to allene is negligible. Measureable polymerisation of allene occurs between 320° and 400° but there is no isomerisation to

q q (A., I.)

CMe:CH; the kinetics are complex. CH₂:CH·C:CH starts to polymerise at about 200° and up to 340° no decomp. is detectable; pressure changes indicate that the reaction does not stop at the dimeride stage but continues to higher polymerides. In the dimerisation of cyclopentadiene (I) the equilibrium is so far on the side of the monomeride that the reaction must be studied at pressures >1 atm., whereas the decomp. can be followed at considerably lower pressures. Drifts of the association rate consts. are presumably due to secondary reactions; since the addition of O₂ does not influence the association, a chain mechanism is apparently precluded. In addition the association of (I) in the liquid state and in tetrahydronaphthalene, and the corresponding decomp. reactions, have been investigated and are discussed. Δ^α-Pentadiene and βγ-dimethyl-Δ^α-butadiene dimerise at measurable rates and the process is not complicated appreciably by side reactions. Rate coeffs. for the diene dimerisations are given. Available data on the rates of αδ- and αβ-addition reactions of dienes are collected; they can be divided into three groups according to the magnitude of the temp.-independent factors. The mechanism of these reactions is considered from statistical and thermodynamic viewpoints, and a mechanism is postulated which involves the association of two mols. via an activated complex to a free radical, which then, by means of another active configuration, forms the ring structure characteristic of the reaction product. Thus the free radical in the case of Δ^α-butadiene has the structure $\text{C}=\text{C}-\text{C}^{\cdot}-\text{C}-\text{C}-\text{C}=\text{C}$ which is stabilised by resonance between four possible electronic structures.

W. R. A.

Highly polymerised compounds. CLXXIII. Kinetics of chain polymerisation. III. Methods and present data. G. V. SCHULZ and E. HUSEMANN (Angew. Chem., 1937, 50, 767—773; cf. this vol., 86, 522).—The mean mol. wt. (*M*) of polymerides produced remains const. during polymerisations at const. temp. The ratio of the velocities of growth and breaking of chains can be deduced from the distribution of the product over various ranges of mol. wt. Their variation with temp. causes variation of *M* with temp. The mechanism of the activation and deactivation processes is discussed. Catalysts act principally by accelerating the primary process. In many cases they decrease *M*, this being attributed to the fact that more chains are commenced simultaneously.

J. W. S.

Kinetics and mechanism of polymerisation processes.—See A., II, 438.

Emission of ultra-violet rays during the slow decomposition of azides. R. AUDUBERT (J. Chim. phys., 1937, 34, 405—415; cf. this vol., 164, 370, 493).—Details are given of results already summarised. The temp. coeff. for the emission of radiation of λ 2150 Å., approx., during the slow thermal decomp. of azides leads to the activation energies KN₃ 20—22 PbN₃ 10—11, and NaN₃ 20—22 and 9—11 kg.-cal. with a transition temp. at approx. 365°, for the photogenic processes. These have activation energies < the slow thermal decomp. and appear to be

independent of the metal and depend only on the N_2 grouping. The thermal decomp. probably commence at the same temp. as the corresponding ultra-violet emissions in the cases of KN_3 and NaN_3 , but the min. temp. for ultra-violet emission are $>$ the initial temp. of thermal decomp. of CaN_6 and PbN_6 .

J. G. A. G.

Homogeneous first order gas reactions. VII. Decomposition of ethylidene dibutyrate and heptylidene diacetate. C. C. COFFIN, J. R. DACEY, and N. A. D. PARLEE. **VIII. Decomposition of trichloroethylidene diacetate and trichloroethylidene dibutyrate.** N. A. D. PARLEE, J. R. DACEY, and C. C. COFFIN. **IX. Decomposition of furfurylidene diacetate and crotonylidene diacetate.** J. R. DACEY and C. C. COFFIN (Canad. J. Res., 1937, 15, B, 247—253, 254—259, 260—263).—VII. The decomp. at 220—290° of 27—450 mm. of ethylidene dibutyrate (I) and heptylidene diacetate (II) vapours each into an aldehyde and an anhydride is homogeneous, unimol., and proceeds to completion. The velocity coeffs. are: (I), $k = 1.8 \times 10^{10} e^{-33,000/RT}$ and (II), $k = 3.0 \times 10^{10} e^{-33,000/RT}$. The sp. reaction velocity is independent of the size of the anhydride radical, and of the aldehyde radical when the latter has >3 C (cf. A., 1932, 232, 702). These esters decompose at approx. the same rates in the liquid and the vapour phases.

VIII. Trichloroethylidene diacetate and dibutyrate decompose into chloral and the respective acid anhydrides at the same sp. rate in the liquid and the vapour states at 210—290°. The reactions are homogeneous and of first order. The velocity coeff. $k = 1.3 \times 10^{10} e^{-33,000/RT}$.

IX. The decomp. at 230—280° of 20—520 mm. of furfurylidene and crotonylidene diacetate vapours each into Ac_2O and the respective aldehydes is homogeneous, unimol., and proceeds to completion. The velocity coeffs. are equal; $k = 1.3 \times 10^{11} e^{-33,000/RT}$. The enhanced val. of k is attributed to the presence of the double linking.

J. G. A. G.

Rate of unimolecular and bimolecular reactions in solution as deduced from a kinetic theory of liquids. R. S. BRADLEY (Trans. Faraday Soc., 1937, 33, 1185—1197; cf. A., 1935, 173).—Mathematical. Collision frequencies and reaction rates in solution are derived from the theory of the liquid state.

J. W. S.

Period of induction in the interaction of mercuric chloride with borax. B. N. SEN (Coll. Czech. Chem. Comm., 1937, 9, 388—392).—The reaction between aq. $HgCl_2$ and $Na_2B_4O_7$ has an induction period of length inversely \propto the square of the concn. of either reagent. The reaction is homogeneous, and the induction period is lengthened by EtOH and glycerol, but shortened by $COMe_2$.

F. J. G.

Influence of solvent and temperature on speed of oxidation of organic substances by chromic acid. I. H. C. S. SNETHLAGE (Rec. trav. chim., 1937, 56, 873—884; cf. A., 1936, 1073).—Rates of oxidation of succinic, glutaric, and adipic acids by CrO_3 have been measured at 25—99° and for different concns. of H_2SO_4 . In all cases a max. rate is found

at $[H_2SO_4]$ about 75%. The relative speeds for the three acids are nearly const. for vals. of $[H_2SO_4] > 90\%$. Rise of temp. increases the abs. rates and displaces the max. towards higher $[H_2SO_4]$. F. L. U.

Rates of combustion in concentration sulphuric acid. J. MILBAUER (Coll. Czech. Chem. Comm., 1937, 9, 393—406).—The oxidation of a no. of gases and vapours, and of certain elements, by H_2SO_4 at 237° has been studied. CH_4 , C_2H_6 , and CCl_4 are not oxidised even in presence of catalysts. Under comparable conditions, the following substances are oxidised without a catalyst at rates decreasing in the order given: C_2H_2 , C_2H_4 , CS_2 , COS , H_2 , CO . Pd-black accelerates the oxidation of these, and of PH_3 , HCN , $(CN)_2$ and $MeSH$. SeO_2 and $HgSO_4$ accelerate the oxidation of S, P, C, Ag, and Sn, and $HgSO_4$ also that of Fe, whilst both substances retard the oxidation of As, Sb, and Bi, and SeO_2 retards also that of Hg, Fe, Ni, Co, and Cu. In the absence of a catalyst the metals are oxidised at rates decreasing in the order Sn, Hg, Co, Fe, Ni, Cu, Al, Ag, Zn, Cd.

F. J. G.

Equilibrium and kinetic studies on reactions of the Menschutkin type in dilute solution. I. Suggested explanation of the solvent effect. G. E. EDWARDS (Trans. Faraday Soc., 1937, 33, 1294—1306).—The reaction $MeI + NPhMe_2 \rightleftharpoons NPhMe_2I$ has been studied in C_6H_6 , $EtOAc$, $COMe_2$, $PhNO_2$, and $MeOH$ solution, the product after various periods at known temp. being analysed by a sensitive electrometric method, which is described in detail. A mechanism is suggested which demands primary formation of unstable salt mols. in solution, these being removed from the reaction phase either by dissociation into the reactants or by crystallisation, the relative velocities of these processes therefore determining the rate of salt formation. The observed velocity coeffs. for salt formation for ten different concns. of reactants in C_6H_6 at 65° do not follow a bimol. law even in the presence of powdered glass, when the reaction proceeds more smoothly. The large variations in the val. of the equilibrium const. with change of solvent are attributed to change in the rate of the dissociation process.

J. W. S.

Kinetics of solvent decomposition of nitroamide in H_2O - D_2O mixtures. V. K. LA MER and J. GREENSPAN (Trans. Faraday Soc., 1937, 33, 1266—1272; cf. A., 1935, 1466).—The rate of decomp. (v) in 100% H_2O is 5.21 times as great as in 100% D_2O when each is 0.01N in HCl . The v -composition curve is similar to that for other prototropic reactions (A., 1925, 309; 1936, 569, 685, 1075). The data can be interpreted on the basis of an exchange between the protons of the substrate and the deuterons of the solvent. The rate-determining step is probably the removal of the proton or deuteron attached to the N atom.

J. W. S.

Functional relation between the constants of the Arrhenius equation. Solvent effects in the formation of quaternary ammonium salts. R. A. FAIRCLOUGH and C. N. HINSHELWOOD (J.C.S., 1937, 1573—1576).—The reaction studied was the formation of methylpyridinium iodide in various mixed solvents. The terms E and $\log PZ$ show a

correlation of the type previously found (this vol., 313) on which is superimposed a tendency for *PZ* to increase with the polarity of the solvent.

F. J. G.

Hydrolysis of acid chlorides. IV. Acetyl, propionyl, and butyryl chlorides. J. RODRIGUEZ VELASCO and A. OLLERO (Anal. Fis. Quím., 1937, 35, 76—83; cf. this vol., 367).—The velocities of hydrolysis have been determined in PhMe at 25° and 45° and these, together with the vals. for *o*-C₆H₄Me·COCl and CH₃Ph·COCl, obey the relation $\log k_2/\log k_1 = 0.30(n_2 - n_1)$ (n = no. of C atoms). The energies of activation of the three chlorides all lie between 5000 and 6000 g.-cal. (see this vol., 142) and by varying the p_H it is shown that the H⁺ do not catalyse the reactions (*loc. cit.*).

F. R. G.

Influence of the activity of hydrogen ions on the velocity of hydrogenation of ketones in a liquid medium in presence of platinised Raney nickel or of platinum-black poisoned with thiophen. B. FORESTI and (SIGNA.) C. CHIUMMO (Gazzetta, 1937, 67, 408—416).—The discrepancy between the accelerating influence of Na₂CO₃ on the speed of hydrogenation (v) of org. substances in presence of platinised Ni, observed by Delépine and Horeau (A., 1936, 686), and the retarding influence of alkalis observed by the authors (Boll. Soc. Eustachiana, 1936, 34, 15, 69, 73) is primarily due to difference of solvent and of catalyst. Two factors determine change of v : activation of the catalyst, and activation of the org. substance; these may vary differently with p_H . Using Ni + Pt, v for COMePh and CPh₂ in 90% EtOH, and for COMePh in *N*-K₂SO₄, increases with p_H (as altered by AcOH and NaOH), and that for cyclohexene in EtOH or K₂SO₄ decreases; C₆H₆ is not hydrogenated. Using PtO₂, v for COMePh or CPh₂ in EtOH decreases with p_H . The progressive poisoning of PtO₂ by thiophen is studied; for COMePh and a catalyst so poisoned, v is min. at neutrality.

E. W. W.

Influence of the walls of the vessel on the course of alcoholic reactions.—See A., II, 445.

Kinetics of biochemical reactions.—See A., III, 427.

Thermodynamics and the velocity of irreversible processes. II. Chemical reaction velocity. III. Changes of structure in solids. A. R. UBBELOHDE (Trans. Faraday Soc., 1937, 33, 1198—1202, 1203—1212; cf. this vol., 362).—II. When the fluctuations giving rise to irreversible chemical change can be treated as independent, the velocity coeff. can be expressed in terms of the equilibrium const. for their concn., which changes regularly with the thermodynamic variables of the system. When they are not independent, wall effects and anomalous dependence on pressure are observed, as, e.g., for chain reactions. Thermodynamic probabilities can be used to express the velocity of irreversible change only when they \propto kinetic probabilities and are not dependent on co-operative fluctuations.

III. Solid-liquid transitions, supercooling, superheating, and the law of successive states are explained in terms of an expression for the probability of finding the requisite fluctuations in the system. Hysteresis

Q Q 2 (A., I.)

in various changes and superconductivity are also discussed.

J. W. S.

Size of bubbles of hydrogen from aluminium in hydrochloric acid. E. JENCKEL and H. HAMMES (Z. anorg. Chem., 1937, 233, 415—423).—When H₂ is being rapidly evolved the mean diameter of the bubbles is large, and the individual sizes vary widely. As the rate of evolution diminishes the bubbles become smaller and more nearly equal in size. These relationships are found when the rate of evolution is controlled either by the action of "poisons" or by the concn. of the acid, and also in electrolysis. The "poisons" have thus no sp. effect on the size of the bubbles.

F. J. G.

Initial corrosion rate of mild steel.—See B., 1937, 1059.

Velocity of oxidation of cobalt. (MME.) G. CHAUVENET and G. VALENSI (Compt. rend., 1937, 205, 317—319).—Between 850° and 1100° the rate of oxidation of ordinary Co is given by $v = 8.51se^{-5520/T}\sqrt{t}$ (v = g. of O₂ absorbed, s = surface). Pure Co oxidises more rapidly.

F. J. G.

Radiations accompanying corrosion of metals. I. A. A. ULJANOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 205—210).—The corrosion of Al, Mg, Pb, Cd, and Zn is accompanied by emission of radiation of $\lambda < 3530$ Å. The λ of the radiation depends on the metal and conditions of corrosion. The intensity of radiation \propto rate of corrosion and can be used to determine the protective properties of oxide films. The order of increasing intensities is Pb, Al, Zn, Cd, Mg, indicating that the film on Pb is more continuous and has greater protective power than that on Mg. Uses of the phenomenon in industry are indicated.

A. J. M.

Influence of traces of oxygen on the kinetics of the thermal decomposition of gaseous acetaldehyde. M. LETORT (J. Chim. phys., 1937, 34, 428—443; cf. this vol., 416).—The initial rate, v_0 , of thermal decomp. of 75—235 mm. of MeCHO at 450—512° is greatly accelerated by 0.0001—0.025 vol.-% of O₂, and the order of the reaction with reference to time is increased. $v_0 = k_0[\text{MeCHO}]^{3/2} + k'_0[\text{MeCHO}]^{3/2}[\text{O}_2]$; at 477°, $k_0 = 8.18 \times 10^{-4}$ and $k'_0 = 0.383$ (units: min., mm.). k'_0 decreases with rise of temp. When a fraction of MeCHO, \propto the O₂ added, has decomposed, the rate of decomp. falls to that observed with pure MeCHO. The no. of mols. of MeCHO decomposed by the action of each O₂ mol. present rises from about 1000 with 0.015 vol.-% of O₂ to approx. 4500 as [O₂] approaches zero. The catalysed reaction is interpreted as a chain reaction initiated by O₂, and is shown to have had negligible effect on the results for pure MeCHO previously published (*loc. cit.*).

J. G. A. G.

(A) Mechanism of the catalytic oxidation of sulphur dioxide in a solution of manganese salts. (B) Action of ozone on solutions of manganous salts. M. K. GRODZOVSKI (J. Phys. Chem. Russ., 1935, 6, 478—495, 496—510).—(A) Catalytic oxidation of SO₂ in presence of Mn⁺⁺ ions occurs through the formation of a complex of the type Mn⁺⁺, xSO₂.

which on oxidation gives SO_3 and Mn^{+++} , the latter being then reduced by SO_2 .

(B) O_3 accelerates oxidation of the $\text{Mn}^{++}, x\text{SO}_2$ complex and also oxidises Mn^{++} directly. It destroys negative catalysts such as PhOH , which are capable of poisoning the Mn catalyst. O_3 does not oxidise H_2SO_4 directly in 0.7–0.9% H_2SO_4 . CH. ABS. (e)

Stabilisation of concentrated solutions of hydrogen peroxide.—See B., 1937, 1045.

Kinetics of catalysed polymerisation of styrene. G. WILLIAMS (Nature, 1937, 140, 363–364).—The kinetics of the polymerisation of styrene (I), catalysed by anhyd. SnCl_4 , in CCl_4 or CHCl_3 at 25° , can be followed by determining the amount of residual monomeric (I) by quant. Br addition to the double linking, using an excess of Br. With specially-purified materials polymerisation is rapid, but with traces of impurities, *e.g.*, those present in commercial SnCl_4 , temporary total inhibition may occur. H_2O produces retardation, and dry HCl is a total temporary inhibitor, probably by addition to the (I) double linking. The polymerides formed have a mol. wt. of the order of 3000. L. S. T.

Theory of heterogeneous catalysis. L. V. PISARSHEVSKI (Acta Physicochim. U.R.S.S., 1937, 6, 555–574; cf. A., 1933, 1018).—The catalytic activity of metals is attributed to pairing of free electrons emitted at the surface with the electrons in adsorbed material, forming an ion which is in condition to react. J. W. S.

Relationship between the magnetic moment of a metal atom and its catalytic activity. T. KITAGAWA (Rev. Phys. Chem. Japan, 1937, 11, 71–75).—A discussion. Atoms of metals used as catalysts usually have a large magnetic moment. Those which do not, usually have such a moment in the multiplet levels for the lowest electronic states. Localised non-homogeneous magnetic fields due to such atoms in the catalyst surface may constitute one of the causes of catalytic activity. H. J. E.

Oxidation and inflammation in contact with hot surfaces. II. Heterogeneous combustion and adsorption of explosive gases on glass surfaces or glass surfaces coated with potassium chloride. Influence of adsorption on the chain reaction of oxygen-hydrogen mixtures. III. Mechanism of the chain reaction of oxygen-hydrogen mixtures and effect of potassium chloride in this combustion. M. PRETTE (Mém. Poudres, 1937, 27, 253–273, 274–296).—II. With explosive O_2 - H_2 mixtures at 500–600° the walls, whether lined with an alkali-metal salt or not, exert a catalytic effect. The surface reaction in every case, except at very low pressures, obeys the unimol. law, $v = k[\text{H}]^2$, and is independent of O_2 pressure; the temp. coeff. is low. A large glass surface is required to obtain a measurable velocity of the heterogeneous reaction, so that the effect of this is practically negligible with the vessels used for studying the homogeneous transformation of the same combustible mixtures. The retardation of the homogeneous reaction caused by the salt lining cannot be attributed to special catalytic activity of the salt, nor is the

greater velocity of the homogeneous transformation caused by the surface. The surface reaction is therefore almost completely independent of the reactions that set up and propagate the chains of homogeneous combustion and inflammation. Either lined or unlined glass surfaces adsorb in the active state appreciable amounts of H_2 and H_2O vapour at 500–600°. The alkali salt lining considerably reduces the velocity of adsorption. Homogeneous transformation into chains of the explosive gas is accelerated or retarded by these adsorptions according as H_2 or H_2O vapour is concerned. The alkaline film considerably reduces the importance of the condensations, but allows reproducible results to be obtained in the study of chain reactions, which is one of the reasons for the lower velocity of the homogeneous reaction in presence of lined surfaces.

III. The mechanism of the action of KCl on the homogeneous reactions of oxidation and ignition of H_2 is discussed. In a vessel coated with KCl the rate of oxidation at $p > 350$ mm. and at 535–560° is given by: $v = K[\text{H}_2]^2[\text{O}_2]e^{-95,000/RT}$. W. J. W.

Influence of solvent on heterogeneous catalysis. Catalysis of hydrogen peroxide [decomposition] in different solvents. I. L. V. PISARSHEVSKI and T. S. GLÜCKMANN (Acta Physicochim. U.R.S.S., 1937, 6, 575–586; cf. A., 1935, 455).—The catalytic decomp. of H_2O_2 by Pt has been studied in H_2O , Et_2O , and H_2O - Et_2O mixtures, and it is concluded that the reaction would not proceed at all in perfectly dry Et_2O . The effect of solvent is attributed to an interaction of forces between the catalyst and its surroundings, which influences the velocity of a catalysed reaction. J. W. S.

Mechanism of the catalysis of the oxidation of carbon monoxide on a hopcalite surface. I. Poisoning of the hopcalite by water vapour. N. SCHURMOVSKAJA and B. BRUNS (Acta Physicochim. U.R.S.S., 1937, 6, 513–530).—The oxidation of CO on a hopcalite surface is of zero order with respect to CO and shows an initial period with increased activity, presumably through oxidation at the expense of the MnO_2 and causing irreversible change in the latter, followed by normal oxidation by mol. O_2 . The heat of activation varies according to the sample from 5000 to 7000 kg.-cal. per mol. The activity decreases linearly with increasing concn. of adsorbed H_2O on the catalyst surface and disappears completely in presence of 2.7% of H_2O . There are two types of active spots on the hopcalite surface, with heats of wetting of 7200 and 500 g.-cal. per mol. of H_2O , respectively. J. W. S.

Catalytic de-oxygenation of nitrogen-hydrogen mixtures.—See B., 1937, 1045.

Activity of the Casale catalyst at atmospheric pressure.—See B., 1937, 1042.

Decomposition of nitrous oxide on a silver catalyst. E. W. R. STEACIE and H. O. FOLKINS (Canad. J. Res., 1937, 15, B, 237–246).—The rate of decomp. of 5–40 cm. of N_2O on a reduced Ag_2O catalyst at 450° is given by $-d[\text{N}_2\text{O}]/dt = k[\text{N}_2\text{O}]/(1 + b[\text{O}_2])$. N_2O is therefore only slightly adsorbed, but O_2 is fairly strongly adsorbed and retards the

reaction. Added O_2 affects the reaction as predicted by the above equation (cf. A., 1936, 807).

J. G. A. G.

Mechanism of activation process of carbon. S. S. BHATNAGAR, P. L. KAPUR, and R. K. LUTHRA (Kolloid-Z., 1937, 80, 265—268).—In specimens of sugar C activated by H_2O vapour, $ZnCl_2$, Na_2O_2 , or $Al_2(SO_4)_3$, increasing activation corresponds with increasing adsorption of $KMnO_4$ or $BzOH$ and with decreasing magnetic susceptibility. These changes are traced to the formation of graphite crystallites in the surface and their preferential oxidation to pyrographitic acid.

E. S. H.

Decomposition of methane on the surface of platinum. I, II. M. KUBOKAWA (Rev. Phys. Chem. Japan, 1937, 11, 82—95, 96—106).—I. The decomp. of CH_4 in contact with an electrically heated Pt wire at 900—1300° and at pressures of 1—20 mm. is entirely heterogeneous. The activity falls progressively owing to formation of C. Other products were C_2H_4 , C_2H_6 , and H_2 . The reaction velocity is given by $dx/dt = k(a - x)/x^n$. The index n is >1 and depends on the heterogeneity of the surface. The retarding effect of H_2 was very slight. The apparent heat of activation was 31 kg.-cal.

II. The above equation is applicable to data for the decomp. of CO on Ni at 240—300°/15—70 cm. and for the decomp. of NH_3 on Pt at 1212°/350 mm. and 865°/200 mm. Changes in the val. of the coeff. n with temp. and pressure, and with the presence of poisons, are discussed.

H. J. E.

Catalytic synthesis of hydrocarbons.—See B., 1937, 1005.

Influence of the solid phase on the thermal ignition of the mixture $CH_4 + 2O_2$. M. V. POLJAKOV and K. K. GRIANENKO (Acta Physicochim. U.R.S.S., 1937, 6, 587—608; cf. this vol., 36).—The induction period in the ignition of $CH_4 + 2O_2$ mixtures in presence of a fixed amount of Pt wire catalyst accords with the formula of Neumann and Egorov (A., 1933, 129). The results are interpreted on the basis of heterogeneous-homogeneous catalysis, in which the surface emits active centres into the vol. (A., 1935, 588).

J. W. S.

Catalyst poisoning from the viewpoint of the specificity of active centres. V. Relative duration of stay of water and ethyl alcohol molecules on copper. A. BORK and M. I. DARIKINA (Acta Physicochim. U.R.S.S., 1937, 6, 375—392).—Measurements have been made at 257.5° with an activated Cu surface. The dehydrogenation of EtOH in presence of H_2O has been followed and compared with the AcOH formed as a result of the reactions $MeCHO + H_2O \rightleftharpoons CHMe(OH)_2 \rightleftharpoons AcOH + H_2$. The amounts of AcOH formed increase with increase in the ratio $H_2O : EtOH$. This removal of MeCHO as AcOH from the active centres allows fresh EtOH mols. to be dehydrogenated; in this way the protective effect of H_2O on the catalyst is explained.

C. R. H.

Rôle of carriers in catalysis. I. E. ADADUROV (J. Phys. Chem. Russ., 1935, 6, 206—220; cf. A., 1935, 1086).—The decomp. of EtOH on various

Cu-on-charcoal catalysts was studied. The catalytic effect increases with the proportion of Cu to C. Heats of activation for various Cu : surface C ratios are calc.

CH. ABS. (e)

Heterogeneous catalytic racemisation of *l*-isobutyl alcohol. R. L. BURWELL, jun. (J. Amer. Chem. Soc., 1937, 59, 1609—1612).—When *l*-Bu^oOH is passed over Pyrex glass at 612°, $[\alpha]_D$ is not altered when 25% decomp. has occurred; when passed over Zn chromite, Cu, Cr_2O_3 gel, or ignited Cr_2O_3 , $[\alpha]_D$ is lowered. The racemisation probably results from dissociative adsorption of *l*-Bu^oOH.

E. S. H.

Paramagnetic isomerisation of maleic acid into fumaric acid in aqueous solution. B. TAMAMUSHI and H. AKIYAMA (Bull. Chem. Soc. Japan, 1937, 12, 382—389).—In extension of earlier work (this vol., 251) it is shown that the isomerisation is catalysed by O_2 , Pt-black, and Pd-black. The catalytic effect of a no. of paramagnetic ions shows a parallelism between the fumaric acid produced and the magnetic moment of the catalyst.

F. R. G.

Thermal decomposition of cresol on a glowing wire.—See A., II, 454.

Catalytic polymerisation of ethylene at atmospheric pressure.—See A., II, 438.

Bromination of bromo-, chloro-, and fluorobenzenes in the gas phase. Effect of temperature and catalyst on the substitution type.—See A., II, 450.

Catalytic desulphurisation [with nickel] of petroleum products.—See B., 1937, 1004.

Effect of platinising on the electrochemical oxidation of Ceylon graphite in sulphuric acid solution. V. SIIVONEN and E. LINDROOS (Suomen Kem., 1937, 10, B, 15—18; cf. this vol., 38).—The strong absorption of H_2 at a graphite cathode in alkaline solution, and of O_2 at an anode in acid, is confirmed. Slight platinising of the anode leads to a higher ratio of $CO_2 : CO$ in the gas evolved in the electrolysis of dil. H_2SO_4 in consequence of the enhanced formation of $\cdot CO \cdot$ groups at the graphite surface, but does not promote evolution of O_2 . If, however, enough Pt is deposited to form a single conducting layer, O_2 is freely evolved.

F. L. U.

Electrodeposition of chromium from potassium dichromate baths.—See B., 1937, 1069.

Electrolytic reduction of *n*-valeraldehyde to *n*-pentane.—See A., II, 443.

Theory of gas reactions in high-frequency electric discharges. A. S. PREDVODITELEV (J. Phys. Chem. Russ., 1935, 6, 417—427).—Theoretical expressions, deduced for the rates of reactions in a gaseous medium containing ions, are in satisfactory agreement with data for the formation of O_3 and for the oxidation of SO_2 .

CH. ABS. (e)

Kinetics of the decomposition of hydrogen sulphide in a high-frequency discharge. L. KOLODKINA (J. Phys. Chem. Russ., 1935, 6, 428—435).—The decomp. of H_2S at -15° to 18° follows a unimol. law. Polysulphides are formed, the decomp. of which on the walls into H and various S polymerides is the rate-determining reaction.

CH. ABS. (e)

Possibility of the influence of long waves of a high-frequency discharge on gaseous chemical reactions. N. ZALOGIN and N. NETSCHAeva (J. Phys. Chem. Russ., 1935, 6, 436—444).—The excitation of O_3 and SO_2 in a high-frequency discharge, and the formation of N oxides, were studied. A dependence of the amount of reaction on the λ was observed. CH. ABS. (c)

Chemical reactions in electric discharges. III. Heterogeneous recombination of atoms. S. ROGINSKI and A. SCHECHTER (Acta Physicochim. U.R.S.S., 1937, 6, 401—418; cf. A., 1935, 1087).—The recombination coeffs. of H and N atoms at a Pt surface have been determined at high temp. Similar experiments with a W surface gave no evidence of recombination. The recombination of O atoms on the surface of easily and difficultly oxidisable metals is also described. Admixture of A with N or O atoms has a stabilising influence on their recombination. The data are discussed. C. R. H.

Chemistry of some photo reactions in non-ideal solutions. G. K. ROLLEFSON (Chem. Rev., 1935, 17, 425—432).—A discussion. CH. ABS. (c)

Correlation of photochemical reactions in gases with those in solution. R. G. DICKINSON (Chem. Rev., 1935, 17, 413—424).—Data are compared. CH. ABS. (c)

Photographic action of sputtered platinum films. S. ONO (Rev. Phys. Chem. Japan, 1937, 11, 76—81).—Films of Pt sputtered in O_2 and placed in close proximity to a photographic film in an atm. of $H_2 + O_2$ caused latent image formation in the film. The effect is different from that of a polished Pt plate and is attributed to the action of H_2O_2 vapour on the film. H. J. E.

Optical investigations of the latent image and the print-out effect of photographic emulsions. A. VAN KREVELD and H. J. JURRIENS (Physica, 1937, 4, 746; cf. this vol., 317).—A correction. H. J. E.

Photographic studies. IV. C. WINTHER (Z. wiss. Phot., 1937, 36, 209—216; cf. A., 1933, 359).—A brief survey is given of primary photochemical action with subsequent secondary reactions in the dark [e.g., H_2O_2 decomp. in presence of $K_3Fe(CN)_6$], and also of the various types of luminescence (with examples). J. L.

Grain size and light-sensitivity of silver bromide.—See B., 1937, 1136.

Chemistry of inorganic [photographic] developers.—See B., 1937, 1137.

Absorption spectrum and photochemical sensitising action of uranyl sulphate in aqueous solution. P. PRINGSHEIM (Physica, 1937, 4, 733—745).—The photolysis of $H_2C_2O_4$ sensitised by UO_2SO_4 cannot be explained by collisions of the second kind because the effect of I^- ions in inhibiting the photolysis is much too small compared with their effect on the fluorescence. Data for the absorption spectrum of aq. UO_2SO_4 and for the effect of $H_2C_2O_4$ in increasing the absorption coeff. for λ 3650 Å. are given. The photolysis is best explained in terms of complex formation. H. J. E.

Mercury-sensitised reactions of methane, deuteromethanes, and the hydrogen isotopes. K. MORIKAWA (J. Chem. Physics, 1937, 5, 751).—Errata (cf. this vol., 317). W. R. A.

Polymerisation of ethylene and acetylene photosensitised by acetone. H. S. TAYLOR and J. C. JUNGERS (Trans. Faraday Soc., 1937, 33, 1353—1360).—Polymerisation of C_2H_4 and C_2H_2 can be induced at room temp. and higher temp. by photodecomp. of admixed $COMe_2$; it is attributed to the action of radicals produced from the $COMe_2$. The yield increases with rising temp., decreasing $[COMe_2]$, and decreasing light intensity. At low $[C_2H_4]$ the polymerisation \propto the $[C_2H_4]$ but becomes independent of it above 30 cm. It is suggested that free radicals also play a rôle in other methods of obtaining polymerisation. J. W. S.

Newer problems in inorganic chemistry. W. KLEMM (Angew. Chem., 1937, 40, 524—535).—A lecture. The structure of inorg. compounds is discussed, and distinction drawn between compounds with ionic linking, at. linking, metallic linking, and compounds of transition elements. The properties of each class of compound are discussed. J. W. S.

Reactions in liquid ammonia and liquid sulphur dioxide. H. J. EMELÉUS (Chem. and Ind., 1937, 813—815).—A review. H. J. E.

Quantitative separation of neon and helium. K. PETERS (Z. physikal. Chem., 1937, 180, 44—50).—Below -225° Ne is quantitatively adsorbed by activated C and pure He can be quantitatively pumped off. Demonstration as a lecture experiment is described. R. C.

Exchange of hydrogen with deuterium in solution. A. E. BRODSKI (Trans. Faraday Soc., 1937, 33, 1180—1185; cf. A., 1936, 160).—In all ten cases so far investigated except that of $COMe_2$ the coeff. of exchange (α) between H and D is approx. 1. Assuming random distribution of H and D atoms between various isotopic mols. in solution a relationship is deduced between α and the equilibrium const. of the exchange reaction. The high val. of α for $COMe_2$ (1.21) is attributed to tautomeric transformation. J. W. S.

Quantitative separation of isotopes of hydrogen by fractional desorption. K. PETERS and W. LOHMAR (Z. physikal. Chem., 1937, 180, 51—57).—Preliminary experiments on the separation of H_2 and D_2 have indicated that fractional desorption in vac. is the most efficient method. R. C.

Separation of isotopes by diffusion. R. SHERR and W. BLEAKNEY (Physical Rev., 1936, [ii], 49, 882—883).—Results of a test investigation of a set of Hertz diffusion pumps on a 1 : 1 mixture of H_2 and D_2 are recorded. 99% D_2 was obtained in one operation. Separation factors for 1 : 1 $H_2 + D_2$, tank H_2 , Ne, and O_2 are given. L. S. T.

Exchange reactions of hydrogen with deuterium. III. Exchange in amino-groups. M. M. SLUCKAJA, J. M. SCHERSCHEVER, and A. E. BRODSKI (Acta Physicochim. U.R.S.S., 1937, 6, 441—446).—

D-H exchange between D_2O and $N_2H_4 \cdot H_2SO_4$, $CO(NH_2)_2$, NH_2Ac , $NH_2 \cdot CH_2 \cdot CO_2H$, and $o-NH_2 \cdot C_6H_4 \cdot CO_2H$ has been studied. The exchange coeff. depends on concn., and the equilibrium const. of the exchange reaction in aq. solution is approx. 1.23.

C. R. H.

Amorphous and crystallised oxide hydrates and oxides. XXXVI. Is lithium hydroxide amphoteric? Heteropoly-bases. A. KRAUSE and S. KRZYŻANSKI (Ber., 1937, 70, [B], 1975—1979).—The solubility of $LiOH$ in $>12.7N$ - $NaOH$ at 20° increases. $LiOH$ thus resembles $Ba(OH)_2$ and is not necessarily amphoteric (cf. Scholder and Patsch, A., 1935, 577; Krause, *ibid.*, 1075). The phenomenon is most readily explained by the assumption of the formation of heteropoly-bases, $LiOH \cdots NaOH \cdots NaOH$. The solid phase is $LiOH \cdot H_2O$ or at $>15.7N$ - $NaOH$ is $LiOH$. $LiOH$ and $NaOH$ do not tend to give mixed crystals. The relationships between hydroxo compounds, heteropoly-bases, and true salts are described.

H. W.

Composition of some complex metallic cyanides. I. Potassium silver cyanide. R. L. DORRANCE, R. C. ELLIS, and A. D. MATHESON (Trans. Electrochem. Soc., 1937, 72, Preprint 7, 109—114).—Conductometric and potentiometric titrations of solutions containing $KCN + AgNO_3$ indicate the formula $KAg(CN)_2$ for the complex cyanide. Free cyanide cannot be titrated by $AgNO_3$ using a Ag electrode.

J. W. C.

Dehydration of copper potassium sulphate. (MME.) N. DEMASSEUX and B. FEDEROFF (Compt. rend., 1937, 205, 457—459).—Debye-Scherrer X-ray diffraction diagrams, obtained at different stages in the dehydration by heating of $K_2Cu(SO_4)_2 \cdot 6H_2O$ and of $CuSO_4 \cdot 5H_2O$ are given. The former gives the dihydrate at $>68^\circ$ and the anhyd. salt at 140 — 160° ; this occurs in another form at $>200^\circ$. $CuSO_4 \cdot 5H_2O$ gives the trihydrate at $>60^\circ$, the monohydrate at 140° , and the anhyd. salt at 240° .

A. J. E. W.

Treatment of silver sulphide precipitates. Extraction of pure silver. C. C. DOWNIE (Chem. & Ind., 1937, 884—885).—Current practice is described.

E. S. H.

Calcium silicates. II. Microstructure. S. KONDO and T. YAMAUCHI (J. Japan Ceram. Assoc., 1934, 42, 304—313; cf. A., 1933, 916).— $CaO \cdot SiO_2$ prepared at 1500° was the almost pure α -form. The $\beta \rightarrow \gamma$ inversion of $2CaO \cdot SiO_2$ prepared at 1700° takes place more suddenly than the $\alpha \rightarrow \beta$ change.

CH. ABS. (e)

Precipitation of tricalcium phosphate and hydroxyapatite. G. FOURETIER (Compt. rend., 1937, 205, 413—415).—Interaction of H_3PO_4 and aq. $Ca(OH)_2$ gives a mixture of $Ca_2(HPO_4)_2$ with colloidal $Ca_3(PO_4)_2$; in contact with the mother-liquor the latter is slowly hydrolysed to $10CaO \cdot 3P_2O_5 \cdot aq$.

A. J. E. W.

Action of methane on strontium and barium chlorides.—See B., 1937, 1044.

Isomeric compounds of boron, hydrogen and oxygen. R. C. RAY (Trans. Faraday Soc., 1937, 33, 1260—1266; cf. J.C.S., 1922, 121, 1088).—When fused

B_2O_3 (x g.) is heated strongly in an Fe tube in a current of H_2 with dried Mg powder ($2.2x$ g.) until the mixture deflagrates, and 2% of Mg powder and 15% of H_3BO_3 are added to the powdered product before extraction with $0.01N$ - KOH at 0° , the sol. extract contains the compounds β - $B_2H_4K_2O_2$ (I) and β - $B_2H_2K_2O_2$, which are separable by fractional crystallisation. If extraction is carried out with H_2O at 0° , and $0.05N$ aq. KOH is added to the filtered solution, $Mg(BO_2)_2$ and $Mg(OH)_2$ are pptd. and the solution on fractional crystallisation yields the compound β - $B_2H_2K_4O_2$ (II). (I) is converted into (II) by the addition of theoretical quantity of aq. KOH and evaporating in a vac. All the compounds are strong reducing agents and are completely oxidised by HNO_3 . All excepting (I) are fairly stable in a vac. or in the absence of H_2O and CO_2 . The equiv. conductivities of solutions of the compounds have been determined at 25° . The structures of these compounds and of their α -isomerides are discussed.

J. W. S.

Reactions of solutions of aluminates with sodium silicate. V. D. DJATSCHKOV (J. Appl. Chem. Russ., 1937, 10, 1211—1215).—Na aluminate (I) solutions are stabilised or coagulated by aq. Na silicate (with const. $Al_2O_3 : SiO_2$), according to the concn. of (I). It is inferred that (I) is in colloidal solution.

R. T.

X-Ray studies on the hydrous oxides. VIII. Gallium, indium, and thallic oxides. W. O. MILLIGAN and H. B. WEISER (J. Amer. Chem. Soc., 1937, 59, 1670—1674).—The compositions of the oxides pptd. under different conditions have been established.

E. S. H.

Pentacarbon dioxide. $O : C : C : C : C : O$. A. KLEMENC and G. WAGNER (Ber., 1937, 70, [B], 1880—1882; cf. A., 1934, 969, 1314).—In the homogeneous gas phase C_3O_2 simultaneously undergoes polymerisation and the change, $C_3O_2 \rightleftharpoons CO_2 + C_2$. The reactions occur at widely differing rates and the controlling conditions have not been established definitely. C_3O_2 from $CH_2(CO_2H)_2$ is almost completely polymerised at 200° but gives a small amount of pentacarbon dioxide, C_5O_2 , b.p. 105° ($\pm 3^\circ$); this is very stable and shows no tendency towards polymerisation. It is slowly transformed by H_2O at room temp. into CO_2 and a tricarboxylic acid, $C_{18}H_{16}O_{12}$ (sparingly sol. Ba salt). Formation of C_5O_2 may occur $C_3O_2 + C_2 = C_5O_2$, but it is remarkable that its production has not been detected in C_3O_2 arising from diacetyltartaric anhydride.

H. W.

Action of ozone on active charcoal. B. BRUNS, E. KOZLOVA, and M. MAKSIMOVA (J. Phys. Chem. Russ., 1935, 6, 977—984).—Active C reacts with up to 63% of its wt. of O_3 at -30° to 20° , forming an acid substance which reacts with 1 equiv. of $NaOH$ per mol. of O_3 absorbed. The reaction is approx. unimol. (0 — 20°), the activation energy being 4400 g.-cal. The acids formed decompose at $>20^\circ$ into CO and CO_2 . Explosion may result on heating rapidly to a higher temp. O_3 -treated C adsorbs C_5H_{12} only weakly. The C recovers its adsorptive capacity partly by heating to 400° or 900° . The area occupied by the acids formed by O_3 is approx.

1700 sq. m. per g. O_3 treatment closes some of the pores formed during activation. CH. ABS. (e)

Prevention of extraction of silicic acid by natural waters stored in glass vessels. B. A. SKOPINTZEV and E. I. PLETNIKOVA (J. Appl. Chem. Russ., 1937, 10, 1310—1313).—The $[SiO_2]$ of sea- or fresh H_2O rises after 1—10 days of storage in glass (giving a positive iodococin reaction), by 0.15—1.6 mg. per litre. Extraction of SiO_2 is prevented by adding 4 drops of 50% H_2SO_4 per 100 ml. of H_2O .

R. T.

Corrosion of tin in nearly neutral solutions. T. P. HOAR (Trans. Faraday Soc., 1937, 33, 1152—1167).—The corrosion of Sn by aq. Na and K salts has been studied by observation of the change of electrode potential (V). The pre-immersion oxide film behaves as a cathode towards unoxidised spots in its pores, and consequently repair of this film first occurs owing to anodic oxide formation on these spots, and V increases. As the pore closes, however, the anodic c.d. rises, and the $[OH^-]$ in its vicinity decreases, until finally the anolyte becomes so acid that the metal tends to be converted into sol. Sn^{++} rather than into oxide, leading to undermining and breakdown of the film. Anodic oxide formation can then recommence and finally forms a black spot at the point of breakdown. Such spots are observed in solutions of salts the anions of which give no ppt. with Sn^{++} (Cl^- , Br^- , ClO_4^- , SO_4^{--} , and NO_3^-) but not in presence of those giving stable ppts. with Sn^{++} (IO_3^- , BO_3^{--} , HPO_4^{--} , CrO_4^{--} , CNS^- , I^- , NO_2^- , HCO_3^- , MnO_4^- , $Fe(CN)_6^{--}$, $Fe(CN)_6^{--}$, and SO_3^{--}). Chlorides cause most attack and conc. solutions cause more rapid breakdown than dil. solutions. NH_4Cl , $MgCl_2$, $CaCl_2$, and $ZnCl_2$ behave like $NaCl$ and KCl , but black spots once formed grow faster in these solutions. The rate of oxidation of freshly abraded Sn is very rapid during the first few min., but becomes relatively slow after about 6 hr.

J. W. S.

Reducing reactions of stannite. H. SATO (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 804—810).—Alkaline solutions of stannite reduce NO_2^- , NO_3^- , and NH_2OH to NH_3 .

R. S. B.

Preparation of phosphorus peroxide. P. W. SCHENK and H. REHAAG (Z. anorg. Chem., 1937, 233, 403—410; cf. A., 1936, 1475).—The most favourable conditions for the prep. of the violet substance (apparently P_2O_6) are described. It is also formed when P_2O_5 alone is sublimed through the discharge tube, P being liberated at the same time. The substance decomposes at 130° in vac. It is insol. in $CHCl_3$, and this can be used to concentrate it by dissolving P_2O_5 . Its solution in H_2O has the reactions of peroxyphosphoric acid, $H_4P_2O_8$.

F. J. G.

Phosphine and arsine derivatives of the group I(b) metals.—See A., II, 449.

Bismuth sulphates. S. ŠKRAMOVSKÝ and O. VONDRÁŠEK (Coll. Czech. Chem. Comm., 1937, 9, 329—344).—The prep. of the compounds $Bi(OH)SO_4 \cdot 4H_2O$, $Bi(OH)SO_4$, $Bi_2(SO_4)_3 \cdot 7H_2O$, and $Bi_3H(SO_4)_6 \cdot 6H_2O$ is described and the existence of

$Bi(OH)SO_4 \cdot H_2O$, $Bi_2(SO_4)_3 \cdot 3H_2O$, $BiH(SO_4)_2 \cdot H_2O$, and $BiH(SO_4)_2 \cdot 3H_2O$ confirmed.

E. S. H.

Sulphur monoxide. VII. Improved method for the preparation, and some properties, of pure sulphur monoxide. P. W. SCHENK (Z. anorg. Chem., 1937, 233, 385—400).—An improved apparatus, permitting the prep. of SO from a known amount of SO_2 , is described. The formula SO has been confirmed by quant. synthesis ($S + SO_2$). On decomp., not all of the SO is given up, so that the "S" remaining contains O corresponding approx. with S_2O . At 100° in vac. this residue gives up its O as SO_2 containing a large proportion of SO and can thus be used as a convenient source of the latter. SO reacts with Cl_2 and Br forming $SOCl_2$ and $SOBr_2$. The limit of the spectroscopic detection of SO is 10^{-3} mm. partial pressure.

F. J. G.

Complexity of the solid state of sulphur trioxide and other substances. H. GERDING and R. GERDING-KROON (Rec. trav. chim., 1937, 56, 794—802; cf. this vol., 218, 291).—A discussion.

F. L. U.

Hyposulphite. V. Reduction by zinc amalgam of sodium sulphite and zinc sulphite under the action of carbon dioxide. T. MUROOKA and H. HAGISAWA. VI. Reduction by zinc amalgam of solutions of sodium hydrogen sulphite. H. HAGISAWA. VII. Reduction of hydrogen sulphite solution by sodium amalgam. F. ISHIKAWA and N. WATANABE (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 783—790, 791—797, 798—803).—V. Aq. Na_2SO_3 and $ZnSO_3$ were reduced by Zn amalgam in presence of 1 atm. of CO_2 , the reactions $2Na_2SO_3 + 3H_2CO_3 + Zn = Na_2S_2O_4 + 2NaHCO_3 + ZnCO_3 + 2H_2O$, $2ZnSO_3 + 2H_2CO_3 + Zn = ZnS_2O_4 + 2ZnCO_3 + 2H_2O$ occurring. The yields of $Na_2S_2O_4$ and ZnS_2O_4 were determined. Reduction of $ZnSO_3$ was the more difficult owing to low solubility, but could be increased by the use of saturated solutions of $ZnSO_3 \cdot 2.5H_2O$ in aq. Na_2SO_3 , when the reaction $Na_2SO_3 + ZnSO_3 + 2H_2CO_3 + Zn = Na_2S_2O_4 + 2ZnCO_3 + 2H_2O$ occurs.

VI. Aq. $NaHSO_3$ was reduced by Zn amalgam at 10° under 1 atm. of CO_2 . The reaction $4NaHSO_3 + Zn = Na_2S_2O_4 + ZnSO_3 + Na_2SO_3 + 2H_2O$ (i) proceeds completely, and is followed by the reaction $ZnSO_3 + 2H_2CO_3 + Zn = Na_2S_2O_4 + 2ZnCO_3 + 2H_2O$ (ii), which is incomplete probably because of the high concn. of $Na_2S_2O_4$ from (i). The solid $3ZnCO_3 \cdot ZnSO_3 \cdot 2Na_2S_2O_4$ separates. The yield in (ii) may be increased to 70% by the use of 10 atm. of CO_2 , and by shaking.

VII. The max. yield of $Na_2S_2O_4$ (89%) was obtained with dil. aq. $NaHSO_3$ and very dil. Na amalgam. With conc. $NaHSO_3$ a solid phase $Na_2S_2O_4 \cdot 3.5Na_2SO_3 \cdot xH_2O$ separates.

R. S. B.

Potassium nitrosodisulphonate. H. GEHLEN (Ber., 1937, 70, [B], 1980—1981).— $(KSO_3)_2NO$ is determined by observing the vol. of NO required to decolorise a solution of a known wt. of it in $N-NaOH$. The rate of decomp. of $(KSO_3)_2NO$ in $NaOH$ increases with increasing concn. of alkali.

H. W.

Question of the existence of selenium monoxide. P. W. SCHENK (Z. anorg. Chem., 1937, 233, 401—402).—Attempts to prepare SeO were unsuccessful. F. J. G.

Transformations produced at low temperatures ("frigadréactions"). A. DEBIERNE and L. GOLDSTEIN (Compt. rend., 1937, 205, 321—322, 368).—The phenomenon already reported (this vol., 473) for H₂ and C and for He and C is also found with H₂ and Be and with He and Be, Mg, and to a smaller extent Al, but slightly or not at all with He and Ni, Cu, or sand. F. J. G.

Chrome[-tanning] liquors. VI. Reduction of potassium dichromate by sucrose. E. R. THEIS and C. L. WEIDNER (J. Amer. Leather Chem. Assoc., 1937, 32, 424—459; cf. B., 1937, 187).—The oxidation products of the reaction under different conditions, in presence of H₂SO₄, using 0—200% of sucrose (I) > the amount theoretically required to reduce the K₂Cr₂O₇, have been determined. On addition of (I) to a boiling mixture of acid and K₂Cr₂O₇ the CO₂ produced amounted to 70—75% of the theoretical when the final [CrO₃] was 10%, and to 85% when the [Cr₂O₃] was 20%. The amounts of H₂C₂O₄, HCO₂H, and AcOH formed were relatively small. Somewhat similar results were obtained when K₂Cr₂O₇ was added to a boiling mixture of acid and (I), but in an open vessel a greater proportion of masking agents was formed. When acid was added to a boiling mixture of K₂Cr₂O₇ and (I) less CO₂ and more acids were formed, the amount of CO₂ decreasing and that of the acids increasing as the (I) concn. increased. When the liquors were reduced in an open vessel most of the volatile acids were lost. D. P.

Methods of preparation of phosphomolybdic acid. E. A. NIKITINA (J. Appl. Chem. Russ., 1937, 10, 1194—1198).—Phosphomolybdic acid (I) is obtained by Debray's method (Compt. rend., 1868, 66, 702) in small yield, and of variable composition. Drechsel's method, involving double extraction with Et₂O, gives pure (I) in good yield. (I) is obtained in 80—85% yield from MoO₃ and boiling aq. H₃PO₄, followed by Et₂O extraction. R. T.

Preparation of polonium sources. W. R. KANNE (Physical Rev., 1937, [ii], 52, 380).—Strong sources were obtained by deposition on Pd from a 0.1N-HCl solution saturated continuously with H₂. N. M. B.

Existence of chlorous anhydride. C. F. GOOD-EVE and F. D. RICHARDSON (Compt. rend., 1937, 205, 416—417).—Cl₂O₃ is not formed by the action of H₂SO₄ on KClO₃ and undecenoic acid (cf. Kantzer, Compt. rend., 1912, 155, 158), the absorption spectrum showing the product to be ClO₂. A. J. E. W.

Reduction of the oxides of manganese by solid carbon in a vacuum. W. BAUKLOH and O. ZIEBEIL (Z. anorg. Chem., 1937, 233, 424—428).—Mn₂O₄ is easily reduced to MnO by C at 700—900°. MnO is not reduced by C alone in vac. below 1150°, and at this temp. almost all the Mn volatilises. In presence of Fe the reduction begins at 800—900°, much of the Mn again being volatilised. F. J. G.

Rhenium and carbon. W. TRZEBIATOWSKI (Z. anorg. Chem., 1937, 233, 376—384).—Re at 800—2200° in CH₄ takes up about 1% of C with expansion of the lattice. No carbide is formed. Coarse Re powder in CO at 450—1100° takes up C, the lattice expanding more than with CH₄, but above 1100° the lattice returns to the smaller dimensions found in CH₄. Highly active Re, prepared by a special method, forms a carbide when heated in CO at 470—600°, but this is completely decomposed at 1600°. F. J. G.

Amorphous and crystallised oxide hydrates and oxides. XXXV. A röntgenographically amorphous ferric oxide hydrate which does not combine with silver and has little activity. A. KRAUSE [with A. SZELIGA and H. SZCZĘKOCKI] (Ber., 1937, 70, [B], 1969—1975).—Short treatment of Fe(OH)₃ gel (I) with boiling N-NaOH gives the polyorthohydroxide (II), which does not age and reacts with Ag; this passes on continued treatment into Fe^{III} oxide hydrate (III), which does not age and does not unite with Ag. (I) dissolves freely in alkaline glycerol, in which (III) is insol. There are thus three röntgenographically amorphous compounds of Fe₂O₃ and H₂O which are of similar appearance but different constitution. Between the two active forms there is no fundamental relationship. Usually the amorphous and colloidal condition implies activity but may be associated with slight activity and unchangeability. Catalytic decomp. of H₂O₂ and ability to unite with Ag do not depend directly on the particle size of the Fe^{III} hydroxide. A coarsely disperse and cryst. hydroxide can be considerably more active than a röntgenographically amorphous and finely divided material. The amorphous condition or ill-marked organisation of the lattice does not necessarily imply the active state. Reactive H atoms exchangeable for Ag are conditional for the catalytic decomp. of H₂O₂. These can be present in cryst. and non-cryst., in ageing and non-ageing hydroxides, the chemical constitution and not the crystal lattice being the decisive factor. Possible constitutions are discussed. H. W.

Molecular structures of iron nitrosocarbonyl Fe(NO)₂(CO)₂ and cobalt nitrosocarbonyl Co(NO)(CO)₃. L. O. BROCKWAY and J. S. ANDERSON (Trans. Faraday Soc., 1937, 33, 1233—1239).—Electron diffraction measurements on Fe(NO)₂(CO)₂ and Co(NO)(CO)₃ vapours indicate that the metal-C and metal-N spacings (about 1.84 and 1.77 Å., respectively) are about 0.16 Å. < the sum of the single bond covalent radii, whilst the C-O and N-O distances are intermediate between those of double and triple linkings. It is suggested that the resonating electronic structure proposed for Ni(CO)₄ (A., 1936, 144) holds for these compounds also. J. W. S.

Metallic carbonyls. XXVI. Action of organic sulphur compounds on the carbonyls of iron and cobalt. W. HIEBER and P. SPACU (Z. anorg. Chem., 1937, 233, 353—364).—[Fe(CO)₄]₃ and [Co(CO)₄]₂ react with RSH (R = Et, Ph) quantitatively thus: M(CO)₄ + RSH = (CO)₃M·SR + CO + 0.5H₂. The products are stable non-electrolytes. In org. solvents they react with o-phenan-

throline which displaces part of the CO. The following compounds have been prepared: $(\text{CO})_3\text{FeSPh}$ (I), m.p. 140° ; $(\text{CO})_3\text{CoSPh}$; $[(\text{CO})_3\text{FeSEt}]_2$ (cf. A., 1928, 1114); $[(\text{CO})_3\text{CoSEt}]_2$; $\text{Fe}(\text{CO})\text{C}_{12}\text{H}_8\text{N}_2\cdot\text{SPh}$; $\text{Fe}(\text{CO})\text{C}_{12}\text{H}_8\text{N}_2\cdot\text{SEt}$; $\text{Co}(\text{CO})_2\text{C}_{12}\text{H}_8\text{N}_2\cdot\text{SEt}$. (I) in C_6H_6 reacts with I in $\text{C}_5\text{H}_5\text{N}$ to form a compound $\text{FeI}_3\text{SPh}\cdot 2\text{C}_5\text{H}_5\text{N}$. F. J. G.

Stereochemistry of plato-tetrammines. H. D. K. DREW, F. S. H. HEAD, and H. J. TRESS (J.C.S., 1937, 1549—1551).—Attempts to resolve α - and β - $[\text{Pt}(\text{ib})_2\text{Cl}_2]$ and $[\text{Pt}(\text{ib} \text{ mt})\text{Cl}_2]$ ($\text{ib} = \text{NH}_2\cdot\text{CMe}_2\cdot\text{CH}_2\cdot\text{NH}_2$; $\text{mt} = \text{NH}_2\cdot\text{CH}_2\cdot\text{CHMe}\cdot\text{CH}_2\cdot\text{NH}_2$) were unsuccessful. This is to be expected for the former but not for the latter, on the basis of a planar configuration. Compounds: $[\text{Pt}(\text{mtCl}_2)_2]$; $[\text{Pt}(\text{ib} \text{ mt})\text{Cl}_2]$; $[\text{Pt}(\text{ib} \text{ mt})\text{PtCl}_2]$; α - $[\text{Pt}(\text{ib})_2]$ α -bromo-d-camphor- π -sulphonate $[\alpha]_D^{20} +56^\circ$; $[\alpha]_{5780}^{20} +58^\circ$; $[\alpha]_{5461}^{20} +69^\circ$ ($c = 2.5$, in H_2O); β - $[\text{Pt}(\text{ib})_2]$ α -bromo-d-camphor- π -sulphonate monohydrate $[\alpha]_{5780}^{20} +65^\circ$; $[\alpha]_{5461}^{20} +68^\circ$ ($c = 1.371$ in H_2O); $[\text{Pt}(\text{ib} \text{ mt})]$ α -bromo-d-camphor- π -sulphonate $[\alpha]_D +55^\circ$ ($c = 2.59$, in H_2O); $[\alpha]_{5780} +56^\circ$ ($c = 1.95$); $[\alpha]_{5461} +68^\circ$ ($c = 1.6$) $[\text{Pt}(\text{ib} \text{ mt})]$ α -nitro-d-camphorate monohydrate, $[\alpha]_D +165^\circ$; $[\alpha]_{5780} +173^\circ$; $[\alpha]_{5461} +206^\circ$ ($c = 1.644$, in H_2O). F. J. G.

Trends of development of [quantitative] spectral analysis. G. S. LANDSBERG (Bull. Acad. Sci. U.S.S.R., 1937, Ser. Phys., 101—112).—The relative accuracy of methods based on internal standards and on the abs. intensity of spectral lines is discussed.

J. S. A.

Application of organic reagents and complex compounds in analytical chemistry. J. V. DUBSKÝ (Mikrochem., 1937, 23, 24—42).—A summary.

J. W. S.

Modern ideas in analytical chemistry. J. V. DUBSKÝ (Mikrochem., 1937, 23, 42—51).—A summary.

J. W. S.

Relationships between scientific chemical work and micro-analysis. J. V. DUBSKÝ (Chem. Weekblad, 1937, 34, 599—604).—An historical account of the author's work and contacts with the early development of micro-analytical methods. S. C.

Inorganic chromatography. I. G. M. SCHWAB and K. JOCKERS (Angew. Chem., 1937, 50, 546—553; cf. A., 1936, 810; this vol., 150).—The technique of chromatographic analysis and its application to various separations are described.

J. W. S.

Detection and elimination of titration errors. I. A. B. SCHACHKELDIAN (J. Appl. Chem. Russ., 1937, 10, 1302—1309).—10 ml. of 0.1N-KI are added to 10 ml. of aq. KI containing X g. of I (also approx. 0.1N), and the solution is titrated with 0.1N- HgCl_2 (A ml.). The titration is repeated, adding 15 ml. of 0.1N-KI (B ml. of HgCl_2), and the val. of X is calc. from $(X + 10)/(X + 15) = A/B$. This method is of general application to all titrations involving errors due to interfering substances, to formation or dissociation of complexes, or to dilution. R. T.

Photo-electric method of measuring p_H values with indicator solutions. G. F. LOTHIAN (Trans. Faraday Soc., 1937, 33, 1239—1243).—By photo-electric measurement of light absorption, p_H vals. can

be determined to ± 0.02 — 0.04 with suitable indicators. Optimum conditions for the determination are described. J. W. S.

Potentiometric titration in neutralisation reactions, with the system platinum-carborundum (graphite). N. J. CHLOPIN (Zavod. Lab., 1937, 6, 548—550).—Electro-titration of acids and alkalis in presence of glycerol and CrO_4^{2-} is possible using Pt-carborundum electrodes. R. T.

Determination of hydrogen deuteride by means of the micro-thermal conductivity gauge. G. H. TWIGG (Trans. Faraday Soc., 1937, 33, 1329—1333).—The Melville and Bolland micro-thermal conductivity gauge (this vol., 471, 582) has been calibrated for the determination of HD in mixtures of H_2 , D_2 , and HD. The composition-resistance curve is not linear, as would be expected theoretically. The technique has been used to follow the reaction $\text{H}_2 + \text{D}_2 \rightleftharpoons 2\text{HD}$ on a Ni catalyst. J. W. S.

Determination of hydrogen, oxygen, and nitrogen in steel.—See B., 1937, 1062.

Rapid determination of water in heat-refractory and other materials, by the distillation method. P. I. DOLINSKI (Zavod. Lab., 1937, 6, 633—634).—25 ml. of turpentine are distilled from 25 g. of powdered material, and the vol. of H_2O in the distillate is determined. R. T.

Determination of moisture in solid substances by measurement of their dielectric constants. S. KNOKE (Z. Elektrochem., 1937, 43, 749—751).—A modified form of the immersion method of measuring ϵ is described. Two equal condensers are enclosed in the same vessel so that the powder can be introduced between the plates of one only; the composition of the immersing liquid is then adjusted until the capacities are equal. Details are given of the application of the method to the determination of the H_2O content of tannin, using C_6H_6 - PhNO_2 mixtures as immersion liquids. J. W. S.

Rapid determination of water in liquid ammonia, using metallic sodium.—See B., 1937, 1042.

Automatic determination of the water content of solid fuels and gases.—See B., 1937, 998.

Detection of bromide and iodide in drugs.—See B., 1937, 1130.

Determination of fluorine.—See B., 1937, 1046.

Determination of traces of fluorine in foods.—See B., 1937, 1127.

Colorimetric determination of hydrogen sulphide in air.—See B., 1937, 1138.

Potentiometric studies in oxidation-reduction reactions. II. Oxidation with potassium iodate. B. SINGH and I. ILAHI (J. Indian Chem. Soc., 1937, 14, 376—380; cf. this vol., 263).— KCNS , $\text{Na}_2\text{S}_4\text{O}_8$, $2\text{N}_2\text{H}_4\cdot\text{H}_2\text{SO}_4$, KMnO_4 , and $\text{K}_2\text{Cr}_2\text{O}_7$ have been determined by potentiometric titrations with KIO_3 in presence of $>4\text{N-HCl}$. R. S. B.

Determination of sulphur and carbon in cast iron and steel.—See B., 1937, 1061, 1062.

Application of salts of complex cations to the microscopical detection of anions. I. Hexamminocobaltic chloride (luteo-cobaltamine chloride). W. A. HYNES and L. K. YANOWSKI (*Mikrochem.*, 1937, **23**, 1—8).—The characteristic cryst. products obtained with $\text{Co}(\text{NH}_3)_6\text{Cl}_3$ are recommended as rapid tests for the detection of HSO_3^- , CrO_4^{2-} , $\text{Cr}_2\text{O}_7^{2-}$, $\text{S}_2\text{O}_6^{2-}$, $\text{Fe}(\text{CN})_6^{4-}$, $\text{Fe}(\text{CN})_6^{3-}$, IO_3^- , MnO_4^- , SO_4^{2-} , sulphosalicylate, and SO_3^{2-} ions. Characteristic ppts. are also obtained with HF_2^- , HSO_4^- , $\text{Co}(\text{NO}_2)_6^{3-}$, SiF_6^{2-} , I^- , VO_3^- , $[\text{Fe}(\text{CN})_5\text{NO}]^-$, VO_4^{3-} , $\text{S}_2\text{O}_8^{2-}$, phosphomolybdate, phosphotungstate, $\text{P}_2\text{O}_7^{4-}$, tartrate, and TeO_3^{2-} ions. The cation present does not affect the cryst. form of the product, which is similar whether the salts of these ions occur alone or mixed with other ions. J. W. S.

Volumetric determination of selenium. Critical study of the Norris and Fay method. W. C. COLEMAN and C. R. McCROSKY (*Ind. Eng. Chem. [Anal.]*, 1937, **9**, 431—432).—Modified procedure is described. The accuracy is 0.1—0.2%. E. S. H.

Electrometric titration of selenates. R. W. GELBACH and G. B. KING (*J. Physical Chem.*, 1937, **41**, 803—807).— H_2SeO_4 can be titrated by means of a glass- Hg_2Cl_2 electrode system. Sol. selenates, with or without free H_2SeO_4 , can be titrated with $\text{Pb}(\text{NO}_3)_2$ using a ferrocyanide-ferriocyanide electrode. With aq. solutions the method is untrustworthy, but data obtained with EtOH of initial concn. 75% are reproducible. C. R. H.

Determination of phosphorus, aluminium, and beryllium in bronzes.—See B., 1937, 1064.

Colorimetric determination of phosphoric acid in fertilisers.—See B., 1937, 1101.

[Determination of chloral hydrate, hypophosphite, phosphite, halogen oxyacids, and phenol.]—See A., II, 477.

Determination of arsenic in mineral oil solutions. J. B. LEWIS and E. L. BALDESCHWIELER (*Ind. Eng. Chem. [Anal.]*, 1937, **9**, 405—406).—The sample is digested with H_2SO_4 , HNO_3 , and K_2SO_4 in a Kjeldahl flask, As is pptd. by H_2S , oxidised with H_2O_2 , and then pptd., ignited, and weighed as $\text{Mg}_2\text{As}_2\text{O}_7$. E. S. H.

Determination of arsenic in ores.—See B., 1937, 1063.

Quantitative spectral analysis of electrolytic copper for arsenic, antimony, bismuth, tin, lead, and iron.—See B., 1937, 1069.

Determination of boric acid in foodstuffs.—See B., 1937, 1127.

Rapid determination of silicon and graphite in cast iron.—See B., 1937, 1061.

Determination of silica in ferrous metals.—See B., 1937, 1061.

Colorimetric determination of silicon in magnesium.—See B., 1937, 1066.

Simultaneous determination of silicon and chromium in ferrochromium.—See B., 1937, 1062.

Determination of silica in siliceous materials.—See B., 1937, 1049.

Titration of carbonates. A. F. KITCHING (*Analyst*, 1937, **62**, 664).—The lag of attainment of equilibrium in the titration of Na_2CO_3 with acids in dil. solution, observable with phenolphthalein, is shown also by bromocresol-purple and bromothymol-blue. J. S. A.

Colorimetric determination of carbon disulphide in gas or motor fuels.—See B., 1937, 1002.

Determination of carbon disulphide.—See B., 1937, 1016.

Rapid determination of inactive gases in nitrogen. J. A. M. VAN LIEMPT and W. VAN WIJK (*Rec. trav. chim.*, 1937, **56**, 755—759).—The N_2 is absorbed by Li at 420° . The apparatus described permits 20 analyses per hr. to be made with an accuracy of $\pm 5\%$. F. L. U.

Systematic analysis of cations without the use of hydrogen sulphide. V. KRASNOVA (*J. Appl. Chem. Russ.*, 1937, **10**, 1290).—Minor modifications of Ravitsch's method (A., 1899, ii, 578) are described. R. T.

Microchemical detection of certain metals in alloys.—See B., 1937, 1065.

Analysis of cations of the first analytical group, with the use of formaldehyde. P. VUKOLOV (*J. Appl. Chem. Russ.*, 1937, **10**, 1288—1289).— NH_4^+ and Mg are detected in the usual way. A portion of solution is conc. to small vol., an equal vol. of 40% aq. CH_2O is added to remove NH_4^+ , and K^+ and Na^+ are detected in the usual way. R. T.

Development of electro-drop analysis. III. H. FRITZ (*Mikrochem.*, 1937, **23**, 61—78; cf. this vol., 326, 426).—The effects of the presence of HCl or NH_3 on the detection of Ag, Hg, Au, and Pt by drop tests on polished Cu are discussed. J. W. S.

Simultaneous determination of calcium and magnesium by volumetric potentiometry. G. BERRAZ and C. CHRISTEN (*An. Soc. cient. Argentina*, 1935, **120**, 103—107).—In absence of CO_2 , pptn. of Ca by 0.1N- Na_2CO_3 is almost quant., whereas basic Mg carbonate is sol. Known vols. of 0.1N- Na_2CO_3 and 0.1N-NaOH are added in turn to the CO_2 -free solution containing Mg and Ca salts, the ppt. is filtered, and Na_2CO_3 and NaOH are determined potentiometrically in the filtrate. CH. ABS. (e)

Rapid analysis of baryte ores.—See B., 1937, 1044.

Rapid determination of barium silicofluoride.—See B., 1937, 1044.

Analysis of aerosols. Absorption and determination of zinc salts and free acid in mists. D. N. FINKELSCHTEIN (*J. Appl. Chem. Russ.*, 1937, **10**, 1266—1280).— H_2SO_4 and ZnSO_4 in air are collected by passage at a linear velocity of ≤ 30 cm. per sec. through filter-paper. The paper is extracted with H_2O , and the extract is titrated with 0.004N-NaOH (Me-red); Zn does not interfere. Zn ($\leq 3 \times 10^{-6}$ g.) is determined nephelometrically, as $\text{K}_2\text{Zn}_3[\text{Fe}(\text{CN})_6]_2$, in a medium containing H_2SO_4

0.7N and $(\text{NH}_4)_2\text{SO}_4$ 0.5M, with addition of a few drops of aq. Na_2SO_3 ; Fe and Cu interfere, and directions for their elimination are given. R. T.

Rapid determination of lead in lead-zinc ores, etc.—See B., 1937, 1064.

Rapid determination of metallic lead in litharge.—See B., 1937, 1045.

Detection and determination of organo-metallic compounds, especially of lead tetraethyl and nickel carbonyl.—See B., 1937, 1131.

Colorimetric determination of copper with sodium diethyldithiocarbamate in presence of moderate amounts of iron. T. P. HOAR (Analyst, 1937, 62, 657—661).—The interference caused by ≥ 25 parts of Fe per part of Cu, in presence of Zn, may be eliminated by adding citric acid (I) + aq. NH_3 . The total coloration is then determined, and the coloration due to the Fe found by the addition of (I) + NH_3 , without $\text{NET}_2\text{CS}_2\text{Na}$, to a separate sample. The effect of a larger amount (25—100 parts) of Fe may be suppressed by adding $\text{Na}_4\text{P}_2\text{O}_7$, but the presence of Zn then interferes. J. S. A.

Electrolytic determination of copper in copper-arsenic preparations.—See B., 1937, 1073.

Determination of copper in cast iron and steel by means of dibromohydroxyquinoline.—See B., 1937, 1061.

Detection of colloidal cerium oxalate in drugs.—See B., 1937, 1130.

Fluorescent test for aluminium. C. E. WHITE and C. S. LOWE (Ind. Eng. Chem. [Anal.], 1937, 9, 430—431).— Al^{+++} (0.2 p.p.m.) can be detected in presence of Be and other associated elements by the orange-red fluorescence produced by Pontachrome Blue Black R in ultra-violet light. Highly coloured ions mask the effect and should be removed by adding excess of NaOH, filtering, and then adding AcOH. E. S. H.

Determination of aluminium, iron, and titanium in silicates.—See B., 1937, 1049.

Determination of alumina in iron ores and of aluminium in steel.—See B., 1937, 1058, 1062.

Analysis of cryolite.—See B., 1937, 1045.

Rapid titrimetric determination of manganese in aluminium and aluminium alloys.—See B., 1937, 1066.

Determination of manganese in cobalt.—See B., 1937, 1064.

Gravimetric determination of iron and aluminium by precipitation as hydroxide with ammonia, in presence of calcium, barium, and magnesium. V. K. ZOLOTUCHIN (J. Appl. Chem. Russ., 1937, 10, 1291—1295).—Fe and Al hydroxides are pptd. by a slight excess of NH_3 , and the ppt. is washed with 2% aq. NH_4NO_3 ; Ca, Ba, and Mg do not interfere. R. T.

Mercurimetric titration of nitroprusside. O. TOMÍČEK and J. KUBÍK (Coll. Czech. Chem. Comm., 1937, 9, 377—387).— $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$ can be titrated potentiometrically with $\text{Hg}_2(\text{ClO}_4)_2$, using a Hg

electrode. The potentials are unstable at first but become steady as the equivalence-point is approached. In the inverse titration the potentials are always steady. The potential "jump" is not very large but can be increased by addition of EtOH. From the mean val. of the equivalence potential the solubility of $\text{Hg}_2[\text{Fe}(\text{CN})_5\text{NO}]$ is 4×10^{-5} g.-mol. per litre. F. J. G.

Influence of the nature and concentration of the electrolyte on the height of the Fe^{II} -ion wave in polarographic analysis. E. S. BURKSER and S. G. MICHLIN (Ukrain. Chem. J., 1937, 12, 369—373).— Fe^{II} may be determined polarographically in conc. aq. Li, Na, NH_4 , K, Rb, Ca, Sr, and Ba chlorides; the height of the wave obtained \propto concn. of the electrolyte and diameter of its cation. R. T.

Polarographic determination of iron.—See B., 1937, 1007.

Determination of iron with 7-iodo-8-hydroxyquinoline-5-sulphonic acid. H. W. SWANK [with M. G. MELLON] (Ind. Eng. Chem. [Anal.], 1937, 9, 406—409).—The best conditions for determining Fe colorimetrically by means of "Ferron" have been determined by spectrophotometric analysis. The colour depends on the reagent concn. and on p_H . Whilst p_H 2.0—3.0 is suitable the val. should be kept within 0.2 unit for a series of comparisons. KH phthalate, glycine, or NaOAc, but not citrates or phosphates, are suitable buffers. The colour is stable for ± 1 week. The interference due to other ions and the influence of p_H thereon are discussed. E. S. H.

Determination of small amounts of iron in mercury.—See B., 1937, 1065.

Rapid analysis of ferrosilicon.—See B., 1937, 1062.

Analysis of alloy steel.—See B., 1937, 1062.

Determination of ferrous oxide in chromite.—See B., 1937, 1045.

Colorimetric determination of chromate solutions. N. VAVILOV (Ukrain. Chem. J., 1937, 12, 293—303).—0.3 ml. of 1% $p\text{-NH}_2\text{C}_6\text{H}_4\text{OEt.HCl}$ in 0.045N-HCl is added to 0.1—0.2 ml. of solution, followed after 1 min. by H_2O to 100 ml., and the coloration is compared with that given by 0.1 ml. of 0.1N- $\text{K}_2\text{Cr}_2\text{O}_7$. PO_4^{+++} , SiO_3^{++} , and powerful reducing and oxidising agents interfere, and tap- H_2O should not be used for dilution. The coloration remains const. for 30 min. The colour reagent is stable. R. T.

Determination of chromium and manganese present together. N. V. LAZAREV (Zavod. Lab., 1937, 6, 627—628).—The method of Lang and Kurtz (A., 1932, 36) is adapted to analysis of minerals. R. T.

Determination of chromium in presence of vanadium in titanomagnetite ore.—See B., 1937, 1065.

Determination of chromium in ferrochrome.—See B., 1937, 1062.

Rapid determination of molybdenum in steels.—See B., 1937, 1062.

Potentiometric determination of molybdenum in ferromolybdenum.—See B., 1937, 1063.

Rapid determination of oxidised and non-oxidised molybdenum in roasted ore.—See B., 1937, 1065.

Analysis of molybdenum.—See B., 1937, 1065.

Determination of tin by means of phenylarsinic acid. I. P. ALIMARIN and M. S. VESHENKOVA (Zavod. Lab., 1937, 6, 644—645).—Polemical, against Sirokanski and Pilnik (B., 1937, 570).

R. T.

Colorimetric determination of tin by means of toluene-3:4-dithiol ("dithiol"). R. E. D. CLARK (Analyst, 1937, 62, 661—663).—Sn is reduced completely to Sn²⁺ by the addition of SH·CH₂·CO₂H (I), and the solution is diluted to contain >60 mg. of Sn per litre. HCl and agar (as stabilising colloid) are added, and then a solution of 0.2 g. of "dithiol" in 100 ml. of 1% NaOH containing 0.3—0.5 g. of (I). The sample is heated at 100° for 1 min., and the red colour developed is colorimetrically determined. J. S. A.

Decomposition of tin ores containing cassiterite.—See B., 1937, 1064.

Determination of tin in lead and in ores.—See B., 1937, 1064.

Determination of tin in ferromolybdenum.—See B., 1937, 1063.

Determination of titanium and its dioxide in acid-resistant steel.—See B., 1937, 1062.

Detection of small amounts of niobium and tantalum in minerals, rocks, and metals. I. P. ALIMARIN and B. I. FRIED (Mikrochem., 1937, 23, 17—23).—Nb and Ta yield white, sparingly sol. ppts. when treated with PhO·As(OH)₂ in strongly acid solution containing tartaric acid. This method permits the detection of 2×10^{-6} g. of Nb₂O₅ + Ta₂O₅ per c.c. The method has been applied to detection of Nb in minerals, rocks, and steels, but is interfered with in the presence of excessive amounts of Sn, Zr, or Ti. The last two can be separated previously with pyrogallol. J. W. S.

Determination of gold and platinum and detection of platinum metals. S. O. THOMPSON, F. E. BEAMISH, and M. SCOTT (Ind. Eng. Chem. [Anal.], 1937, 9, 420—422).—The composition of the crystals formed by PtCl₄ with dimethylglyoxime (I) corresponds with PtC₃H₁₄N₄O₄. (I) can be used for the determination of Au, but not of Pt. The efficiency of various reagents for the detection of Pt metals and Au is discussed. Pyrogallol and ephedrine hydrochloride can be used as qual. tests for Os. E. S. H.

Low-temperature thermostat. L. C. BEADLE and F. A. BOOTH (Nature, 1937, 140, 279).—The arrangement described maintains a const. temp. to within 0.1° over the range 4—10°. Working at 5° it consumes approx. 0.5 cwt. of ice in 100 hr.

L. S. T.

Constant temperature: principles in electric thermostat design: a mains-operated isothermal chamber constant to 0.001°. L. B. TURNER (J. Inst. Elect. Eng., 1937, 81, 399—422).—A detailed

survey of the relation between "hunting," associated with delayed action in all forms of apparatus, and the design of electrically operated devices. An apparatus designed to obtain the smallest possible inconstancy consistent with derivation of supplies from a.c. mains alone, and in accord with the principles deduced, is described. N. M. B.

Thermal conductivity method for the determination of isotopic exchanges in the simpler gaseous molecules. N. R. TRENNER (J. Chem. Physics, 1937, 5, 751).—Erratum (cf. this vol., 479).

W. R. A.

Quantitative fluorescence-photometric micro-analysis. I. Fluorescence-photometer for use with visible and ultra-violet light. H. MINIBECK (Biochem. Z., 1937, 293, 219—227).—With the apparatus described determinations may be made with an error of $\pm 2-3\%$. Materials which fluoresce in visible and ultra-violet light are best examined in visible light only. W. McC.

Can the exposure in structure analysis [by X-rays] be shortened? C. J. KROM and H. B. VAN DER SPENKEL (Rec. trav. chim., 1937, 56, 760—765).—By the use of more sensitive film and suitable fluorescent screens exposure may be reduced to one fifth of the usual time. F. L. U.

Seeman-Bohlin X-ray camera for high temperatures. R. F. BOYER and C. NUSBAUM (Physical Rev., 1936, [ii], 49, 884).—An arrangement for the X-ray analysis of the cementite and graphite pptn. in cast Fe at high temp. is described. L. S. T.

Absorption factor for the rotating-crystal method of crystal analysis. O. P. HENDERSHOT (Rev. Sci. Instr., 1937, [ii], 8, 324—326; cf. Bradley, A., 1935, 1306).—Mathematical. The problem for the case of a crystal used in its natural shape is examined. Results and their use with highly absorbing crystals are given. N. M. B.

Source for quantitative spectrographic analysis of solutions. K. B. THOMSON and O. S. DUFFENACK (Physical Rev., 1936, [ii], 49, 880—881).—The source described has been applied to the analysis of biological fluids. Concn. ranges are Mg 0.0001—0.05, Na 0.01—1.0, K 0.025—0.8, and Ca 0.005—0.1%.

L. S. T.

Electrical discharge as an aid in chemical synthesis. P. W. SCHENK (Angew. Chem., 1937, 50, 535—546).—A summary of recent work on the use of electric discharges in preparative chemistry.

J. W. S.

Testing of materials by the high-velocity electron diffraction method. Z. G. PINSKIER (Zavod. Lab., 1937, 6, 572—579).—Electron scattering methods are recommended for the study of surface films and layers. R. T.

Halide reference half-cells in p_H determinations. W. J. HAMER (Trans. Electrochem. Soc., 1937, 72, Preprint 19, 257—281).—A discussion of the problems encountered, with special reference to liquid junction potentials. F. R. G.

Temperature and hysteresis errors in calomel half-cells. B. WINGFIELD and S. F. ACREE (J. Res.

Nat. Bur. Stand., 1937, 19, 163—175).—The variation with temp. of the e.m.f., and the time lag in the attainment of the equilibrium e.m.f., of saturated and unsaturated KCl-Hg₂Cl₂ half-cells have been investigated. Both are more important in unsaturated than in saturated cells. Hysteresis errors of 0.9 mv. were observed during a temp. change of 8°. The importance of these sources of error is emphasised. Minor fluctuations can be eliminated by enclosing the half-cell in a Dewar vessel. O. D. S.

Measurement of direct potentials originating in circuits of high resistance. R. H. CHERRY (Trans. Electrochem. Soc., 1937, 72, Preprint 12, 173—184).—Apparatus is described in which the "inverted triode" thermionic valve is applied to measurements of difference in potential in circuits having resistances $>10^{11}$ ohms. Applications are discussed. J. W. C.

Relay-free mercury vapour triode control for a constant-temperature water-bath. H. S. SCHWENK and D. E. NOBLE (J. Physical Chem., 1937, 41, 809—810).—A circuit which will maintain temp. to $\pm 0.005^\circ$ is described. C. R. H.

Valve galvanometer for glass electrodes. H. KOTHE (Z. Spiritusind., 1937, 60, 257). J. S. A.

Antimony electrode in p_H measurements. T. R. BALL (Trans. Electrochem. Soc., 1937, 72, Preprint 17, 235—247).—For the Sb-Sb₂O₃ electrode, p_H at 20° is given by $(E + 0.020)/0.058$ with an error of ± 0.06 between the limiting p_H vals. 2—7. No serious variation due to the source of the Sb could be detected, whilst greater uniformity is secured by the use of Sb₂S₃, when p_H is given by $(E + 0.0148)/0.0577$ with an error of ± 0.04 over the range 2—10. The sulphide electrode cannot be used with citrate buffers but 10% sugar, 2% starch, and 0.5M-NaNO₃ solutions are without deleterious effect. F. R. G.

Sensitive glass electrode of durable form. A. E. CAMERON (Ind. Eng. Chem. [Anal.], 1937, 9, 436). E. S. H.

Ballistic method of determining p_H with a glass electrode. V. A. PTSCHELIN and A. C. FAIZULINA (Zavod. Lab., 1937, 6, 616—619).—A ballistic potentiometer for p_H measurements is described. R. T.

Metallised glass electrodes. P. A. KRIUKOV and A. A. KRIUKOV (Zavod. Lab., 1937, 6, 619—621).—A special glass bulb is coated internally with Wood's alloy, and the metallic coating is covered with a layer of ceresin. This type of electrode combines high mechanical strength with low resistance. R. T.

Micro-thermal conductivity gauges. J. L. BOLLAND and H. W. MELVILLE (Trans. Faraday Soc., 1937, 33, 1316—1329; cf. this vol., 471).—Thermal conductivity cells of 0.05 c.c. capacity which are suitable for the micro-analysis of 0.005 c.c. (at n.t.p.) of binary mixtures of gases of different conductivities are described. A theory is developed to account for the behaviour of the gauge when filled with H₂, D₂, and H₂-D₂ and H₂-HD-D₂ mixtures, and conditions are defined so that a gauge will or will not discriminate between equilibrated and non-equili-

brated H₂-D₂ mixtures. The optimum conditions for analysis of mixtures of *o*- and *p*-H₂ have been worked out. By utilising the variation of rotational sp. heats of H₂ and D₂ with temp., a method is developed for analysis of ternary mixtures containing H₂, D₂, and another constituent not condensed in liquid air (CO, CH₄, O₂, N₂, or inert gas) or H₂ and two other gases of different thermal conductivities. J. W. S.

Determination of the concentration of liquids by means of conductivity measuring apparatus. F. LIENEWEG and O. DOBENECKER (Siemens Z., 1937, 17, 172—177).—An apparatus for determining the electrical conductivity of electrolytes is diagrammatically described, and the applications of conductivity measurements are discussed. R. B. C.

(A) Cloud chamber. (B) Light source for cloud chamber illumination. H. R. CRANE and J. C. MOUZON (Rev. Sci. Instr., 1937, [ii], 8, 351, 351—352).—(A) A simple apparatus with controlled expansion speed and variable expansion ratio, 1—1.4, is described.

(B) The source consists of a W wire under slight tension flashed in a tube through which N₂ flows continuously. N. M. B.

Time delay circuit for operating Wilson cloud chambers. C. C. JONES (Rev. Sci. Instr., 1937, [ii], 8, 319—322).—All switching operations are performed by grid glow tubes with time delay inputs. The cycle can be initiated either at regular intervals (by a motor and reduction gear) or by coincidences in Geiger counters above and below the chamber.

N. M. B.

Efficiency of counters and counter circuits. A. E. RUARK and F. E. BRAMMER (Physical Rev., 1937, [ii], 52, 322—324).—Mathematical. New formulæ for correcting counter data for particles missed because of the finite recovery times of the counter and its recording circuits are derived to apply to a wide range of conditions realised in practice. N. M. B.

Photo-electric spectrophotometer. F. H. COATES (Canad. Chem. Met., 1937, 21, 305—306).—Instability due to high amplification is avoided by a new arrangement using two cells of the generating type in parallel, the increased initial output enabling lower amplification to be used. A. K. G. T.

Electrical properties of solids. I. Experimental methods. R. M. FUOSS (J. Amer. Chem. Soc., 1937, 59, 1703—1707).—Procedure for determining abs. vals. of ϵ of solids is described and the elimination of errors due to imperfect contact between sample and electrodes explained. ϵ of fused quartz is 3.810. The vals. for Pyrex glass vary with temp. and frequency. E. S. H.

Perfect e/m filter as a mass spectrograph. J. A. HIPPLE, jun., and W. BLEAKNEY (Physical Rev., 1936, [ii], 49, 884).—An arrangement of charged particles in uniform and crossed electric and magnetic fields, which serves as an ideal e/m filter and can be used as a mass spectrograph, is described. L. S. T.

Lithium ion source [for nuclear work]. C. A. WHITMER and M. L. POOL (Physical Rev., 1936, [ii], 49, 882). L. S. T.

Universal ion source. L. P. SMITH and H. A. CARLOCK (Physical Rev., 1936, [ii], 49, 646).

L. S. T.

Apparatus for the automatic analysis of fluctuations in radioactive disintegration. R. L. DRISCOLL (Physical Rev., 1936, [ii], 49, 877).

L. S. T.

Apparatus for the measurement of artificial radioactivity. S. N. VAN VOORHIS (Physical Rev., 1936, [ii], 49, 889).—An apparatus for the more accurate determination of the decay curves of artificial radioactive substances is described. The half-lives of radio-Na, -Cl, and -N, produced by deutron bombardment of NaF, LiCl, soot or Acheson graphite, respectively, are 14.8 hr., 37.0, and 10.0 min.

L. S. T.

Reagent bottle with an automatic zero-point burette, without a stand. E. V. PERVUSCHIN (J. Appl. Chem. Russ., 1937, 10, 1321—1324).—Apparatus is described.

R. T.

Device for testing hæmocytometers and other pipettes of small capacity. E. L. PEFFER (J. Res. Nat. Bur. Stand., 1937, 19, 177—180).—Apparatus allowing of rapid volumetric testing accurate to about 0.6% is described.

O. D. S.

Semi-micro gas evolution apparatus applied to kinetic studies in heavy water. J. GREENSPAN, V. K. LA MER, and S. LIOTTA (J. Amer. Chem. Soc., 1937, 59, 1606—1608).—Apparatus and procedure for precision measurements are described. The rate of decomp. of $H_2N_2O_2$ in aq. D_2O at 25° has been determined.

E. S. H.

Automatic compensation of flowmeters for pressure variations. R. K. TAYLOR (J. Amer. Chem. Soc., 1937, 59, 1605).—A device for maintaining const. delivery rates, irrespective of pressure variations at the flowmeter outlets, is described.

E. S. H.

Burette clamp. G. R. KOKASCHINSKI and V. A. SEREDKINA (Zavod. Lab., 1937, 6, 636).

R. T.

Pressure control and indicator. T. J. KILLIAN (Physical Rev., 1936, [ii], 49, 647).—A new type of electronic vac. gauge, which is sensitive to indicate or control pressure, has been developed.

L. S. T.

Flux balance for the measurement of magnetic susceptibilities in alternating fields of low intensity. L. G. HECTOR and G. R. ECKSTEIN (Physical Rev., 1936, [ii], 49, 643).—Susceptibilities of a no. of paramagnetic substances have been measured at frequencies from 60 to 5000 cycles per sec. in fields of ± 16 oersteds by the balance described.

L. S. T.

Pneumatic collar for the McBain sorption balance. K. V. TSCHMUTOV and A. T. CHALESOVA (J. Appl. Chem. Russ., 1937, 10, 1325—1326).—Apparatus is described.

R. T.

Approximate aërodynamical method of determination of mol. wt. of volatile liquids and their mixtures. A. JUZICHIN (J. Appl. Chem. Russ., 1937, 10, 1281—1287).—The aërodynamical method, using a Ranarex gas analyser, serves for the approx. determination of the mol. wt. of solvents.

R. T.

Micro-flotation method for the precise comparison of liquid densities and its application to a

preliminary investigation of the distribution of heavy water in certain salt hydrates and to other matters. J. S. ANDERSON, R. H. PURCELL, T. G. PEARSON, A. KING, F. W. JAMES, H. J. EMELÉUS, and H. V. A. BRISCOE (J.C.S., 1937, 1492—1501).—The apparatus enables precise comparisons of d to be made on samples of a few c.c. Observations on the D content of H_2O from various sources, and particularly from cancerous tissues, are recorded. Hydrated $CuSO_4$ preferentially retains H_2O on dehydration, and considerable interchange occurs in the solid phase below 100°. Amine hydrochlorides exchange all H directly linked to N when dissolved in heavy H_2O . With cobaltamines the exchange is complete but occurs at a measurable rate.

F. J. G.

Removal of static charges from glassware, using a high-frequency discharge. F. W. VAN STRATEN and W. F. EHRET (Ind. Eng. Chem. [Anal.], 1937, 9, 443—445).—The influence of electric charges on the apparent wt. of glass vessels is discussed. The charge can be removed before weighing by holding the vessel in a region of silent discharge for <1 min.

E. S. H.

Wood's metal reductor. G. F. SMITH and C. S. WILCOX (Ind. Eng. Chem. [Anal.], 1937, 9, 419—420).—The reducing properties of Wood's metal have been investigated. An advantage over Bi, Cd, or Pb liquid amalgams is the easy removal of the alloy after solidification. Results for the determination of Fe are given.

E. S. H.

Burette-filling device for portable reagent reservoirs. N. E. RIGLER (Ind. Eng. Chem. [Anal.], 1937, 9, 436).

E. S. H.

Fractional distillation micro-apparatus. L. C. CRAIG (Ind. Eng. Chem. [Anal.], 1937, 9, 441—443).—The apparatus is designed for use with 0.5—2.0-g. samples. Results for the separation of binary org. liquid mixtures are reported.

E. S. H.

Distilling apparatus for separation of isotopes. G. B. PEGRAM, H. C. UREY, and J. HUFFMAN (Physical Rev., 1936, [ii], 49, 883).—The apparatus described separates constituents of close b.p., e.g., H_2O and D_2O , or $H_2^{16}O$ and $H_2^{18}O$. The ratio of concn. of the latter pair was changed by a factor of 1.31 at atm. pressure.

L. S. T.

Automatic control of a stream of air produced by an ordinary suction pump. G. F. ASPREY (Ann. Bot., 1937, 1, 567—568).—By means of the valve described fluctuations in air flow caused by changes in H_2O pressure are eliminated.

A. G. P.

Torsion manometer for the measurement of the force of a molecular ray. M. J. COPLEY and V. DEITZ (Rev. Sci. Instr., 1937, [ii], 8, 314—317).—The quartz torsion fibre is sputtered with Ag to conduct away electrical charges, and the beam is intercepted by a small Al vane. The measurement of v.p. of KCl and CsI crystals in the temp. range 800—950° K. is described and discussed (cf. A., 1936, 1331).

N. M. B.

Relative humidity nomograph. S. M. TROXEL (Rev. Sci. Instr., 1937, [ii], 8, 350).—The nomograph

is based on the equation of Brooks (cf. A., 1935, 599).
N. M. B.

Viscosimeter with suspended level.—See B., 1937, 988.

Drainage error of viscosimetry of aqueous solutions. G. JONES and R. E. STAUFFER (J. Amer. Chem. Soc., 1937, 59, 1630—1633).—Apparatus for measuring the drainage of liquids in viscosimeters and pipettes as a function of time of outflow, shape and size of the glass surface, and properties of the liquid is described. For a given surface the after-drainage vol. \times outflow time \propto the kinematic viscosity of the liquid.
E. S. H.

Anti-aerosol filters of esparto pulp. Protection of anti-aerosol filters against moisture by a layer of dehydrating material. L. DAUTREBANDE, P. ANGENOT, and E. DUMOULIN (Compt. rend., 1937, 205, 329—330).—The resistance of the filters to

piercing is greatly increased by the use of a protective layer of SiO_2 gel or active charcoal.
F. J. G.

Carborundum ultrafilters. J. DUCLAUX and M. AMAT (Compt. rend., 1937, 205, 315—316).—A layer of finely divided SiC can be used as an ultrafilter.
F. J. G.

Production of thin gold films. C. S. GIBSON (Nature, 1937, 140, 279—280).—Au is deposited as a coherent film on glass and other surfaces at room temp. from solutions of organo-Au compounds or their derivatives in a suitable solvent, such as EtOH, to which alkali is added.
L. S. T.

Early history of phosphorus. J. R. PARTINGTON (Sci. Progr., 1936, 30, 402—412).
CH. ABS. (e)

Life and work of Henry de Chatelier (1850—1936). P. PASCAL (Bull. Soc. chim., 1937, [v], 4, 1557—1611).

Geochemistry.

Electrical conductivity of air in Madrid. A. DUPRIER and J. M. VIDAL (Anal. Fis. Quim., 1937, 35, 5—20).—The conductivity quotient κ/κ_+ is subject to an annual variation having its max. in April.
F. R. G.

Variations in the quantity of ozone in the atmosphere in the neighbourhood of Shanghai. P. LEJAY (Compt. rend., 1937, 205, 307—309).—The variation from month to month is very regular and can be correlated with meteorological conditions.
F. J. G.

Radioactivity of air included in the snow layer near the soil on mountains. H. GARRIGUE (Compt. rend., 1937, 205, 420—422; cf. A., 1935, 468).—The Rn contents of 16 samples of air are recorded, and the observed enrichment is correlated with the wind conditions.
A. J. E. W.

Determination of radon and thoron in the subsoil air at Sante Fé. F. E. URONDO (An. soc. cient. Argentina, 1935, 120, 108—112).—Vals. found are slightly $>$ those reported for other localities.
CH. ABS. (e)

Composition of the mixture of rare gases from the hot springs of Bath. M. W. TRAVERS (J.C.S., 1937, 1561—1562).—The rare-gas residue (about 13 c.c. per litre of gas) consists of A with about 0.1% Ne and about 12% He. The He must originate from radioactive change.
F. J. G.

Consumption of oxygen in sea-water under controlled laboratory conditions. H. R. SEIWELL (Nature, 1937, 140, 506—507).—Determinations of the amount of O_2 disappearing after 10 days from sea- H_2O kept under controlled conditions indicate that conditions in the sea, other than temp., restrict the rate of O_2 consumption.
L. S. T.

Bromine content of the water of the Sea of Japan. V. V. VASILIEV (J. Appl. Chem. Russ., 1937, 10, 1296—1301).—The experimentally determined Br content is in good agreement with that

calc. from the formula $100x/y = 0.347$, where x and y are the Br and Cl contents, in mg. per kg.
R. T.

Hydrocatalase of the mineral springs in Korytnice. R. ŘETOVSKÝ (Chem. Obzor, 1937, 12, 1—5; cf. A., 1936, 1471).—The H_2O of the spring "Žofie" has a fairly const. p_{H} of 6.0, probably owing to buffering by HCO_3^- and CO_2 , and contains a considerable quantity of Fe and Mn. The rate of decomp. of H_2O_2 , which is rapid with fresh H_2O , rapidly decreases with the age of the H_2O , although H_2O 9 months old still showed hydrocatalase quite distinctly. The high initial activity and long life may be due to Mn, which enters into the kinetics of the reaction.
F. R.

Isotopes of potassium and lithium in Saratoga mineral water and cryptozoon. A. K. BREWER and O. BAUDISCH (J. Amer. Chem. Soc., 1937, 59, 1578—1579).—Determination of the abundance ratios shows an appreciable concn. of ^{41}K in the mineral H_2O and a small concn. in the cryptozoon formations, but the ratio for Li is unchanged.
E. S. H.

Chemical analysis of thirty Peruvian mineral waters. V. CÁRCAMO MÁRQUEZ (Bol. Soc. Quím. Peru, 1937, 3, 15—45).—An extension of earlier work (A., 1935, 60) to a no. of other Peruvian sources. The high Li content is notable.
F. R. G.

Chemical and physico-chemical investigations of the mineral waters of the Perla (Piza). U. SBORGI and A. GALANTI (Annali Chim. Appl., 1937, 27, 213—232).—Various data are recorded and the activities of the ionic constituents have been calc. The amounts of Sr^{++} , Ba^{++} , Li^+ , K^+ , and Mn^{++} are notable.
O. J. W.

Mineral water from Canne in Puglie. G. BUODO (Annali Chim. Appl., 1937, 27, 251—256).—The H_2O is bacteriologically pure and notably radioactive; it contains Br^- without any I^- , and traces of borates.
O. J. W.

Glycylglycine as a sea-water buffer. A. TYLER and N. H. HOROWITZ (Science, 1937, 86, 85—86).—Glycylglycine (I) can be used as a satisfactory buffer between p_H 7 and 9 in carbonate-free sea- H_2O . PO_4''' is useful only at a low p_H since Ca^{++} and Mg^{++} are pptd. from sea- H_2O at higher p_H vals. The titration curve with a glass electrode reproduced for 0.025M-(I) in carbonate-free sea- H_2O gives pK' 8.1 at 18.5°. The effect on the development of freshly-fertilised sea urchin eggs in carbonate-free sea- H_2O containing various concns. of (I) is described. L. S. T.

Distribution of potassium in nature. H. HARRASSOWITZ (Kali, 1937, 31, 103—106, 124—127).—Examination of published data shows that the K:Na ratio is >1 in sedimentary rocks and dry soil, plant cells, and the human body, and <1 in mineral waters, rivers, damp soil, sea- H_2O , and marine plants. K is thus the characteristic alkali cation of the land, Na of the sea. This is attributed to the higher chemical reactivity of K, its greater ease of adsorption, and pptg. action on colloid systems. R. C. M.

Carbon in nature. W. NODDACK (Angew. Chem., 1937, 50, 505—510).—A lecture. The geochemistry and distribution of C, and the C cycle in nature, are discussed. J. W. S.

Mineralogy of W. Australia. X. E. S. SIMPSON (J. Roy. Soc. West. Australia, 1936—37, 23, 17—35).—Descriptions and chemical analyses are given for almandine from Marvel Loch, anthophyllite from Mt. Palmer and Marvel Loch (with analyses of related rocks), daphnite, Mt. Satirist and Kalgoorlie; chloritoid mica-schist, Mt. Magnet; columbite and manganocolumbite, McPhee's Range; dufrenite, Gingin; elbaite, Ravensthorpe; gahnite, Goyamin Pool; grossularite, Melville, Toodyay, and Meier's Find; hæmatite (hydrohæmatite), Inglehope; and pisanite, Ravensthorpe. L. S. T.

Crystal structure of plazolite. A. PABST (Amer. Min., 1937, 22, 861—868).—X-Ray diffraction patterns give a 12.14 ± 0.01 Å. with 8 mols. in the body-centered unit cube. The structure is similar to that of grossularite (I). An at. arrangement in the space-group O_h^F , which satisfactorily accounts for the diffraction data, is given. (I) from Georgetown, California, has a 11.85 ± 0.01 Å., d_{calc} 3.60, and d_{obs} 3.55. L. S. T.

Unit cell and space-group of sternbergite, $AgFe_2S_3$. N. W. BUERGER (Amer. Min., 1937, 22, 847—854).—A Weissenberg study of sternbergite (I) from Joachimsthal, Bohemia, shows that a new orientation is necessary (cf. A., 1936, 817). This gives a 6.61, b 11.64, c 12.67 Å., with 8 $AgFe_2S_3$ per cell; space-group Ccm (C_{2h}^{12}) or $Ccmm$ (D_{2h}^{14}). There is no true isomorphism between (I) and cubanite (cf. *loc. cit.*). L. S. T.

Iron sulphide in Black Sea deposits. A. D. ARCHANGELSKI (Bull. Soc. nat. Moscou, Sect. géol., 1934, 12, 431—440).—The deposits are described. CH. ABS. (e)

Structures of meteoric irons. G. DERGE and A. R. KOMMEL (Amer. J. Sci., 1937, [v], 34, 203—214).—Back-reflexion X-ray Laue photographs from

plates of kamacite from the Cañon Diablo and Amelia Farm [= Bethany, South Africa] siderites suggest that [110] and [111] of kamacite are parallel to (111) and [110] of taenite (A., 1926, 1084; 1930, 1398). A good Widmanstätten pattern was produced in a Ni-Fe alloy (27% Ni) by cooling for 12 hr. from 1400°. Metallurgical evidence indicates that the Widmanstätten structure of meteorites is due to slow cooling from high temp. L. J. S.

Structure and composition of the earth's crust. P. DORN (Chem.-Ztg., 1937, 61, 713—715).—A review.

Fourteenth list of new mineral names. L. J. SPENCER (Min. Mag., 1937, 24, 601—628).—A dictionary list of 195 names collected from the lit. of the past three years. Chemical formulæ are given for each mineral, and a systematic chemical classification is appended. L. J. S.

Mesozoic bauxites of the eastern slope of the middle Urals. B. M. FEDOROV (Bull. Soc. nat. Moscou, Sect. géol., 1935, 13, 42—69).

CH. ABS. (e)
Aluminium ore. Y. ASADA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 837—850).—Mineralogical and geological studies have been made on alunite. R. S. B.

Structure and chemical composition of glauconite. P. P. PILIPENKO (Bull. Soc. nat. Moscou, Sect. géol., 1935, 13, 155—169).—Glauconite is a mixture of amorphous SiO_2 and of a cryst. material of the composition $m(SiO_2, H_2O) + n(2R^{III}_2O_3, pR^I_2O)$, with $R^{III} = Fe, Al$, $R^I = 0.5Ca, 0.5Mg, 0.5Fe, K, Na, Li$, or H, and $p = 2-4$. CH. ABS. (e)

Bituminous series of Uresan River. N. M. STRACHOV and S. S. OSIPOV (Bull. Soc. nat. Moscou, Sect. géol., 1935, 13, 3—39). CH. ABS. (e)

Magnesium-zinc-spinels from Ceylon. B. W. ANDERSON and C. J. PAYNE (Min. Mag., 1937, 24, 547—554).—Data are given for certain blue gem spinels which show higher d and n than usual for spinel. Analysis (by M. H. HEY) of one of these gave Al_2O_3 63.21, FeO 1.93, MgO 16.78, ZnO 18.21 = 100.13, showing a transition from Mg-spinel to Zn-spinel (gahnite), and the name gahnospinel is suggested. The analysed specimen has d 3.967, n_D 1.7465; other specimens show ranges d 3.584—3.981, n_D 1.7153—1.7469. L. J. S.

Paragenesis of kyanite-amphibolites. C. E. TILLEY (Min. Mag., 1937, 24, 555—568).—Description with chemical analyses (by H. C. G. VINCENT) of these rocks from Glenelg, Scotland, and discussion of their origin by the metamorphism of an igneous rock. L. J. S.

Wollastonite solid solutions from Scawt Hill, Co. Antrim. C. E. TILLEY (Min. Mag., 1937, 24, 569—572).—Micro-sections of modified dolerite in contact with chalk show crystals of wollastonite possessing a zonal structure with variations in the optical characters. Portions with the higher vals. α 1.642, γ 1.657, $2V$ 60—63° had higher d 3.11 and contained Fe, proving them to belong to the system $CaO-FeO-SiO_2$ (A., 1933, 1120). L. J. S.

"Iron-rhodonite" (from slag) and pyroxmangite and their relation to rhodonite. M. PERUTZ (Min. Mag., 1937, 24, 573—576).—Pyroxmangite from Glenelg, Scotland (this vol., 431), has a unit cell of dimensions a 7.4, b 17.1, c 6.7 Å., α 83°, β 94°, γ 113°, proving it to be distinct from rhodonite. An "iron-rhodonite" from iron slag (Whiteley and Hallimond, 1919) agrees with pyroxmangite rather than with rhodonite. L. J. S.

Igneous rocks from the iron-producing district of Bilbao, Province of Vizcaya, North Spain. H. SERVICE (Trans. Inst. Min. Met., 1935—6, 45, 55—71).—The Bilbao Fe ore deposits occur in a Middle Cretaceous coralline limestone between mudstones, sandstones, and argillaceous limestones. The primary siderite has been formed by metasomatic replacement of CaCO_3 by Fe-bearing, carbonated hydrothermal solutions and is covered by an enriched gossan of hematite and limonite. The associated igneous rocks comprise carbonated gabbro, olivine-dolerite, camptonite, spilite, and trachyte, all of which have been subjected to hydrothermal alteration by CO_2 -rich H_2O , showing that igneous activity preceded, at least in part, metasomatism.

A. R. P.

Keratophyres of the Lahn trough. H. GÖTZ (Tsch. Min. Petr. Mitt., 1937, 49, 168—215).—24 new chemical analyses of these rocks show their variation in composition (SiO_2 55.88—73.65%). Analyses are also given of carbonates rich in Fe present in the rocks. L. J. S.

Fields of association of some rock-forming minerals. S. R. NICKOLDS (Tsch. Min. Petr. Mitt., 1937, 49, 101—116).—Many mineral and rock analyses are plotted in a tetrahedron with CaO , MgO , total Fe as FeO , and " $+\text{Al}_2\text{O}_3$ " (i.e., not combined with alkalis in feldspar) at the corners. This shows the distribution and association of Fe-Mg minerals and anorthite. L. J. S.

Magnesian series and the "supracrustal" rocks in the west of the Côte d'Ivoire. P. LEGOUX (Compt. rend., 1937, 205, 158—160).—A geological description is given. A. J. E. W.

Origin of the marcasite sink-hole deposits of Central Missouri. W. A. TARR (Amer. Min., 1937, 22, 830—841).—The mode of occurrence of the ores, the constituent minerals, and the alteration of Fe sulphides to oxides are described, and the origin of the marcasite is discussed. L. S. T.

Occurrence of fine-grained authigenic feldspar in shales and silts. J. W. GRUNER and G. A. THIEL (Amer. Min., 1937, 22, 842—846).—X-Ray examination shows that orthoclase occurs in various shales as grains $<1 \mu$. in diameter. An analysis of a fraction of the Glenwood shale at Minneapolis is given, and the origin of the feldspar is discussed. L. S. T.

Densities and structural relationships of kaolinites and anauxites. J. W. GRUNER (Amer. Min., 1937, 22, 855—860).—Re-determinations of d and the dimensions of the unit cells of analysed samples of four kaolinites and three anauxites (I) from different localities are recorded. The results for d do not support Hendrick's view (this vol., 383) that

the higher $\text{SiO}_2:\text{Al}_2\text{O}_3$ ratio in (I) is due to removal of Al and OH leaving a defective structure with holes. A substitution of tetrahedral SiO_4 groups for octahedral $\text{AlO}_2(\text{OH})_4$ is proposed, and the loss of OH entailed is supported by the chemical analyses. Determinations of d by centrifuging in heavy liquids can be made as accurate as those obtained with a pyknometer. L. S. T.

Diffusion and its relation to ore deposition. S. DUFFELL (Econ. Geol., 1937, 32, 494—510).—The penetration of rocks, dry and saturated with H_2O , by aq. solutions of CuSO_4 , FeCl_3 , Na_2S , and eosin has been determined. The rocks varied from porous sandstones to a marble of low porosity. There is no marked difference between penetration of the dissolved salt into the saturated and unsaturated specimens, but with the latter, there is a separation of and more rapid penetration by the solvent, due mainly to capillary action. After this, penetration occurs by diffusion, as is the case with the saturated specimens. Similar experiments with colloidal solutions of Fe or Mo oxide, Fe^{III} ferrocyanide, Mn oxide, and silicic acid show that the dispersed phase does not penetrate the rock specimens along capillary openings to any great extent. The results are discussed in relation to ore deposition, and indicate that diffusion plays a more important rôle in the migration of solutions through rocks than is generally supposed. L. S. T.

Geology of the Monarch and Kicking Horse ore deposits, British Columbia. E. A. GORANSON (Econ. Geol., 1937, 32, 471—493).—The deposits consist of Pb-Zn ores formed by replacement of brecciated, cryst., Cambrian dolomite. The minerals consist chiefly of hypogene sphalerite, galena, pyrite, and dolomite, with minor amounts of chalcopyrite, quartz, barite, and Ag; small amounts of As, Sb, Bi, Mn, and a trace of Au have been found in the concentrates. Supergene products include limonite, selenite, calcite, anglesite, and copiapite. The genesis of the deposits is discussed. The Pb-Zn ratios indicate that Zn was more mobile than Pb. L. S. T.

Mount Isa ores. H. F. GRONDIJS and C. SCHOUTEN (Econ. Geol., 1937, 32, 407—450).—Results of a microscopical examination of >250 polished specimens of ores from Mt. Isa mine, Queensland, Australia, are given. The common minerals are pyrite (five varieties), sphalerite, galena, pyrrhotite, arsenopyrite, marcasite, quartz, and carbonates; several uncommon minerals, e.g., vallerite, are present. Oxidation and supergene enrichment processes and products are discussed. The mineralisation sequences are: early deposition of pyrite in the slate; crushing and faulting of the pyritic slates and deposition of the sulphides of Fe, Zn, Cu, and Pb; oxidation and supergene sulphide enrichment yielding chalcocite, covellite, anglesite, cerussite, jasper, goethite, and lepidocrocite. A syngenetic origin for the ore is excluded, and an origin by metasomatic replacement is proposed. L. S. T.

Sulphur deposits of the Sierra de Gádor, Province of Almeria, Spain. D. WILLIAMS (Trans. Inst. Min. Met., 1935—6, 45, 395—423).—The

principal deposits lie at or near the base of the Muschelkalk dolomitic limestones; within these S occurs in residual clays derived from their disintegration, as well as along bedding planes and fault fissures in the unaltered Middle Triassic rocks. Evidence is adduced to show that the S is epigenetic, being partly derived from the interaction of ascending aq. H_2S with carbonate rocks and partly from incomplete oxidation of H_2S by atm. O_2 ; simultaneously with these reactions aluminisation of the surrounding rocks occurred accompanied by pptn. of FeS_2 , gypsum, and ochres, the minerals being formed by metasomatic replacement of rock constituents. A. R. P.

Mineralogy of the Virginia diabase. A. A. PEGAU (Amer. Min., 1937, 22, 872—874).—The two chief minerals are labradorite and augite. Other minerals are enumerated, and local variations of the diabase in the no. and variety of these minerals are described. L. S. T.

Lincoln sill. J. M. TREFETHEN (J. Geol., 1937, 45, 353—380).—Chemical analyses and origin are discussed. L. S. T.

Heterogeneity of parent magma. J. S. DELURY (J. Geol., 1937, 45, 381—390).—The view that igneous rock diversity is accounted for mainly by the heterogeneity of parent magma, and that processes of differentiation play a minor and local part, is advanced. L. S. T.

Pegmatitic hornblende from the Carsphairn Complex. W. A. DEER (Geol. Mag., 1937, 74, 359—361).—The pegmatites consist of milky quartz, greenish-black hornblende, and a clove-coloured sphene. For the hornblende optical properties, a chemical analysis, and a formula are given. L. S. T.

Marginal rocks of the Cairnsmore of Carsphairn Complex. W. A. DEER (Geol. Mag., 1937, 74, 361—376).—Chemical analyses are recorded. L. S. T.

Chemical indications and physicochemical investigation of salt deposits. V. I. NIKOLAEV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 15, 479—482).—Comparison of the concn. of KCl , MgBr_2 , and H_3BO_3 in the salt waters and evaporated salts of the Ural-Emba region and the Mangischlak peninsula indicate the probability of K and B deposits, and possibly petrol, in the Mangischlak peninsula. Investigation of K and Br content of well-waters in the Kalmuck region indicates the presence of salt deposits in the latitude 46° to 47° . O. D. S.

Valentinite from the Ballao mine. A. CAVI-NATO (Atti R. Accad. Lincei, 1937, [vi], 25, 140—144).—Crystallographic and optical properties are recorded. O. J. W.

Emery of Samos. J. DE LAPPARENT (Tsch. Min. Petr. Mitt., 1937, 49, 1—30).—A collected account of previous papers (A., 1933, 928; 1934, 386; 1935, 1099).—Chemical analyses of the emery rock (called samosite) show that it consists largely of diaspore. L. J. S.

Chastolite crystals. H. TERTSCH (Tsch. Min. Petr. Mitt., 1937, 49, 31—41).—The enclosed impurities marking the cross pattern are accumulated in pyramids of growth from the basal planes and

along the prism edges. Exception is taken to the idealised figure given by Dana, which would imply a hemimorphic growth. L. J. S.

Eclogite from Gilsberg, Saxony, and its metamorphism. H. HENTSCHEL (Tsch. Min. Petr. Mitt., 1937, 49, 42—88).—A petrographical description with chemical analysis of the rock is given, and its origin discussed. L. J. S.

Structural scheme of proustite and pyrrargyrite. R. HOCART (Compt. rend., 1937, 205, 68—70).—X-Ray data have been applied to the calculation of interat. distances. The most probable arrangement of the AsS_3 or SbS_3 groups and Ag atoms is similar to the arrangement of the CO_3 groups and Ca atoms in calcite. C. R. H.

Comparison of the radioactivity of Alsace rocks by the tube counter method. E. ROTHÉ and T. KOPCEWICZ (Compt. rend., 1937, 205, 165—166).—The activities of a granite from Brifosse and of a rhyolite from Roskopf have been compared with a standard Ra prep. A. J. E. W.

Substitution of SiO_4 and SO_4 groups for PO_4 groups in the apatite structure: ellestadite, the end-member. D. McCONNELL (Amer. Min., 1937, 22, 977—986).—The series apatite-wilkeite (II)-ellestadite (I) has been investigated in terms of both end-members and two intermediate members. (I), d 3.068, a new mineral from Crestmore, Riverside Co., California, has a_0 9.53, c_0 6.91 Å. (both ± 0.01 Å.); space-group C_{2h}^{22} ; it is uniaxial, negative, with ϵ 1.650 ± 0.002 , and ω 1.655 ± 0.002 . The structural formula of (I) and, with a slight modification, of (II) is $[\text{Ca}_6(\text{F}, \text{Cl}, \text{O}, \text{OH})_2][\text{S}, \text{Si}, \text{P}, \text{C})\text{O}_4]_6(\text{Ca}, \text{C}_4)$, indicating that two fifths of the Ca^{++} are located on threefold axes and can be replaced by C. Three fifths of the Ca^{++} are linked to F' , Cl' , O' , or OH' , and cannot be replaced by C. All the Ca^{++} are linked to O, which are arranged in tetrahedral configurations with S, Si, P, or C at their centres. The almost complete replacement of P, one of their constituents of apatite, in (I) by S and Si without appreciable alteration of structure is significant. A chemical analysis of (I) is recorded. L. S. T.

Stauroilite area of Patrick and Henry Counties, Virginia. C. H. MOORE, jun. (Amer. Min., 1937, 22, 990—996).—Stauroilites from this area are described and illustrated. L. S. T.

Occurrence of detrital authigenic feldspar [near Mt. Morris, Michigan]. D. STEWART, jun. (Amer. Min., 1937, 22, 1000—1003). L. S. T.

Occurrence of diaspore in quartzite. E. L. BERG (Amer. Min., 1937, 22, 997—999).—Diaspore (I) is an abundant and characteristic mineral in the Sioux quartzite from several localities in S.W. Minnesota and S.-E. S. Dakota. No similar occurrence of (I) is known. L. S. T.

Woodhouseite, a new mineral of the beudantic group. D. W. LEMMON (Amer. Min., 1937, 22, 939—948).—Woodhouseite (I), $2\text{CaO} \cdot 3\text{Al}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 2\text{SO}_3 \cdot 6\text{H}_2\text{O}$, hexagonal, d 3.012, hardness $4\frac{1}{2}$, uniaxial positive and also biaxial, $a:c$ 1:1.170, α $91^\circ 42'$, n 1.636, n_g (estimated)

1.638, n_z 1.647 (± 0.003), occurs in quartz veins that adjoin and penetrate the commercial andalusite deposits of White Mountain, Mono Co., California. It is readily sol. in dil. acid after the H_2O has been eliminated by heating. (I) has [A. RAUTENBERG] SiO_2 0.30, Al_2O_3 36.63, CaO 12.31, MgO 0.11, Na_2O 0.08, K_2O 0.02, H_2O+ 13.25, H_2O- 0.20, P_2O_5 18.13, SrO 0.25, BaO 1.00, SO_3 17.59, total 99.87%. Sr-bearing natroalunite, d 2.90, also present in the deposits, is more abundant than (I), and has SrO 2.81%, $Na_2O : K_2O : SrO = 5 : 4 : 3$, n_z 1.608, n_w 1.587 (± 0.003). (I) is discussed in relation to other members of the alunite-beudantite group. L. S. T.

Examination of precious stones by means of their fluorescence in ultra-violet light. J. GRANT (Analyst, 1937, 62, 731).—Examples are given of differences in ultra-violet fluorescence which may be used to distinguish stones of similar appearance in daylight. E. C. S.

Naturally-occurring silver amalgams. F. HEIDE (Naturwiss., 1937, 25, 651).—The % composition and other properties of naturally occurring Ag amalgams are summarised. They all belong to either the α - or the γ -phase, no example of the β -phase having been observed. Spectroscopic analyses show that these amalgams are two-component systems only as a first approximation, other metals, e.g., Cu, Sn, Pb, and Ba, being present. Au could not be detected without preliminary concn. W. O. K.

Constitution and properties of some clay materials (bentonites and kaolin). V. PRÉVER and C. GORIA (Chim. e l'Ind., 1937, 19, 305—312).—A comparison of the chemical and physical properties of two samples of bentonite and of one of kaolin. These properties are discussed in relation to the mineral constituent of the three materials.

O. J. W.

Persistence of fluorescein in earths. Influence of ferruginous formations. A. GUILLERD and P. ÉTRILLARD (Compt. rend., 1937, 205, 77—79).—Fragments of limestone were immersed in a dil. solution of fluorescein (I) for 24 hr. The limestone was washed daily with definite quantities of H_2O of p_H 7, and the concn. of (I) in the wash- H_2O were determined. When the concn. had been reduced to 5×10^{-11} g. per c.c., the limestone was immersed in an acid solution of p_H 5.2 for 4 hr. On washing, the concn. of (I) rose to 10^{-8} g. per c.c. The flocculation of ferruginous H_2O containing (I) does not appear to reduce the concn. of (I). The results are discussed with reference to reported instances of earths retaining (I) during 2—3 years, although subject to stream action. C. R. H.

Variability in Wisconsin till and its influence on soil character. R. S. STAUFFER (Amer. J. Sci., 1937, [v], 34, 235—243).—Mechanical analyses of glacial till from which three soil types have been derived show differences in the proportion of pebbles and clay materials. L. J. S.

Turquoise deposits of Courtland, Arizona. W. P. CRAWFORD and F. JOHNSON (Econ. Geol.,

1937, 32, 511—523).—Turquoise of gem quality occurs in the quartzite and the granite with limonite, kaolin, and sericite as associated minerals. Its origin is genetically related to the granite. L. S. T.

Age of the uraninite from the Ruggles mine, Grafton Centre, N.H. B. M. SHAUB (Science, 1937, 86, 156).—The calc. age is 302×10^6 years. The hand-picked material, d 7.02, has [F. HECHT] Pb 3.37, Th 0.38, U 76.38, and S 0.04%. L. S. T.

Mica in argillaceous sediments. R. E. GRIM, R. H. BRAY, and W. F. BRADLEY (Amer. Min., 1937, 22, 813—829).—Illite is the general term proposed for the clay mineral constituent of argillaceous sediments belonging to the mica group. This constituent can now be separated in a relatively pure state as colloidal fractions from shales, clays, etc., by means of the supercentrifuge fractionation technique. Optical properties, X-ray data, and chemical analyses of purified samples from several localities in Illinois are recorded and discussed. The purest samples indicate a composition $2K_2O, 3MO, 8R_2O_3, 24SiO_2, 12H_2O$, where M is Fe^{++} or Mg. Dehydration curves of muscovite and illite are compared, and base-exchange data for illite are recorded. Illite is somewhat similar to muscovite in many respects, but is closest in composition to the phengite variety of mica. Relationships to other micas are discussed, and chemical analyses of micas resembling illite are tabulated for comparison.

L. S. T.

Sediments of gyttja at Gipka. P. NOMALS (Acta Univ. Latviensis, Lauk. Fak. Ser. 1, 1930, 65—79).—The newly-discovered deposit is described. Destructive distillation at 400—450° gave a very volatile, brown oil (30—32 kg. per cu. m. of naturally wet gyttja). Air-dried gyttja can be used as a low-grade fuel. CH. ABS. (e)

Origin of petroleum. C. D. NENITZESCU (J. Inst. Petroleum Tech., 1937, 23, 469—482).—Relevant theories are surveyed and experimental facts and observations summarised. C. C.

Origin of coal, asphalt, and petroleum. E. BERL (Österr. Chem.-Ztg., 1937, 40, 385—387).—All natural fuels are derived from plant materials, fusain and brown coals from lignin, bituminous coals, asphalt, and petroleum principally from cellulose and other carbohydrates. The course of the transformation has been determined by the geological conditions, particularly by the acidity or alkalinity of the surrounding medium. Petroleum has been derived from asphalt (and not *vice versa* as is often assumed) by cracking and hydrogenation. A. B. M.

Barzas coals. G. L. STADNIKOV, V. G. PUTZILLO, and L. N. BAKUSHINSKAJA (Bull. Acad. Sci. U.R.S.S., 1936, Ser. Chim., 387—396).—Comparison of analytical data for *Laminaria digitata* and *japonica* and for *Fucus vesiculosus* with those for Barzas coal shows that of the constituents of the plants only lignin has survived. It is concluded that plant carbohydrates and pectins did not play any part in the production of petroleum. R. T.